EPA-5603

Tony Nesky

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Revisions to National Emission Standards for Operating Uranium Mill Tailings

United States Environmental Protection Agency

Notice of Proposed Rulemaking

Limits on Air Pollution from Uranium Mill Tailings

EPA limits emissions of hazardous air pollutants under the authority of the Clean Air Act. EPA's "National Emission Standards for Hazardous Air Pollutants (NESHAPS)" (40 CFR Part 61) set limits on hazardous air pollutants from different activities and facilities. Subpart W of 40 CFR Part 61, "National Emission Standards for Operating Uranium Mill Tailings," limits radon emissions from tailings at operating uranium mills. EPA originally issued Subpart W in 1989 (54 FR 51703, December 15, 1989).

Current Standards for Uranium Mill Tailings

The Subpart W standards limit the radon releases and doses to the public from the normal operations of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores. The facilities are commonly known as uranium mills and the byproducts as tailings. Subpart W currently has different requirements for byproduct material impoundments built before 1989 and those built afterward. Pre-1989 impoundments are subject to a numeric limit on radon emissions. Post-1989 facilities must control radon limits through one of the two following work practices:

1. No more than two impoundments may operate at any time and each cannot be larger than 40 acres. Disposal of tailings takes place in phases.
2. Disposal of tailings takes place continuously, and no more than 10 acres of tailings may be uncovered at any time.

The Rulemaking Process: From Laws to Environmental Standards

An environmental law is enacted when Congress passes it and the President signs it. Specific laws make EPA responsible for writing regulations which specify what must be done to obey the law. Many environmental regulations set standards that limit the amount of a hazardous material that can be discharged into the environment.

After an environmental law is enacted, EPA conducts a scientific analysis of the issues and, if necessary, proposes new or revised regulations in a *Notice of Proposed Rulemaking (NPRM)*. The proposal is listed in the *Federal Register* so that members of the public can consider it and send their comments to us. EPA will consider the comments received as it finalizes the regulations. The comments and EPA's response to them become part of the public record.

Final regulations are published in the *Federal Register* as a *Final Rule*, and added to the *Code of Federal Regulations (CFR).*

How You Can Participate

The public will have 90 days to submit comments on this *Notice of Proposed Rulemaking* starting the day of its publication in the *Federal Register*. All submissions will become part of the official public record for this rulemaking. Be sure to identify your submission by Docket ID No. EPA–HQ–OAR–2008-0218. You can submit comments by email, by regular mail, online or in person. Detailed instructions for submission of comments are in the *Notice of Proposed Rulemaking (NPRM)*. A link to the text is provided at: www.epa.gov/radiation

United States Environmental Protection Agency | Office of Radiation and Indoor Air (6608J)

EPA 402-F-13-052 | April 2014
www.epa.gov/radiation

Why Revise the Standards?

The Clean Air Act Amendments of 1990 require EPA to review the standards of Subpart W periodically. After completing a recent review, EPA concluded that revisions were needed to clarify definitions and to be more specific about what kind of tailings impoundments are subject to the standard. EPA also concluded that requirements for generally available control technology (GACT) or management practices are the best means to control radon emissions from tailings piles. GACT are commercially available methods, practices and techniques for operation and maintenance of emissions control systems.

Key Changes in the Proposed Rule

Definition of Uranium Recovery Facilities: The proposed rule would apply to all operating uranium recovery facilities, which are defined as those facilities that manage uranium byproduct material or tailings, including conventional uranium mills, in-situ leach recovery facilities, and heap leach facilities. "Operating" means that an impoundment is being used for the continued placement of uranium byproduct material or tailings, or is in standby status.

GACT for All Conventional Impoundments, Regardless of Age: In the proposed rule, EPA would no longer have different standards for impoundments constructed before and after 1989. EPA is proposing that the work practices for impoundments built after 1989 would be required as GACT at all conventional impoundments, regardless of their age. Studies of the work practices have shown that they are effective in controlling radon releases to the environment. EPA proposes dropping the numeric radon standard for pre-1989 facilities because it is not needed when the GACT controls are in place.

GACT for Non-Conventional Impoundments: "Non-conventional" impoundments (commonly known as evaporation or holding ponds) hold uranium byproduct materials in ponds that are covered by liquids. In this proposed rule, EPA would require control of radon emissions by covering the tailings in the ponds with at least one meter of liquid at all times.

GACT for Heap Leach Piles: EPA is proposing to require operating heap leach piles to maintain a moisture content of 30 percent at all times. Studies have shown that 30 percent moisture content keeps radon emissions from heap piles at acceptable levels.

Construction Requirements for All Impoundments: The current Subpart W standard references other regulations that require impoundments to be designed, constructed and installed in a way that protects adjacent soils and waters. Specifications include top and bottom liners as well as a leachate collection and removal system. In the proposed rule, these requirements would apply to all types of uranium recovery facilities.

Recordkeeping Requirements: Under the proposed rule, uranium recovery facilities would have to maintain records to demonstrate compliance with requirements for impoundment construction, liquid coverage of ponds, and moisture content of heap leach piles.

EPA and Uranium Extraction Operations

EPA's mission is to protect human health and the environment. The Agency sets limits on the amount of radioactivity that can be released into the environment. EPA enforces the Clean Air Act requirements at Subpart W. The Nuclear Regulatory Commission (NRC) has regulatory responsibility for licensing and operation of uranium extraction facilities and other commercial facilities that use radioactive materials.

If enacted, this proposed rule would not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States.

Other Regulatory Agencies

U.S. Nuclear Regulatory Commission (NRC): The NRC regulates the civilian uses of nuclear materials in the United States by licensing facilities that possess, use or dispose of nuclear materials; establishing standards; and inspecting licensed facilities.

States: Most states have agencies responsible for regulating the use of radiation and radioactive emissions. Some states operate under agreement with the NRC to license and regulate certain types of radioactive materials.

EPA-5221

Angelique Diaz

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This is the text of the Proposed Rule signed by Administrator Gina McCarthy on April 17,2014. Upon publication of this proposed rule in the Federal Register, this pre-publication version will be replaced with a link to the official Notice of Proposed Rulemaking. A 90-day public comment period will begin upon publication in the Federal Register.

ENVIRONMENTAL PROTECTION AGENCY 6560-50-P

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to

this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket’s normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-

1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information
- A. Does this action apply to me?
- B. What should I consider as I prepare my comments to EPA?
- C. Acronyms and Abbreviations
- D. Where can I get a copy of this document?
- E. When would a public hearing occur?

II. Background Information for Proposed Area Source Standards
- A. What is the statutory authority for the proposed standards?
- B. What criteria did EPA use in developing the proposed GACT standards for these area sources?
- C. What source category is affected by the proposed standards?
- D. What are the production operations, emission sources, and available controls?
- E. What are the existing requirements under Subpart W?
- F. How did we gather information for this proposed rule?

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990
CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256

TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112]." EPA promulgated 40 CFR part 61, Subpart W, "National Emission Standards for Radon Emissions From Operating Mill Tailings," ("Subpart W") on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In

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[2] None of the sources in this source category are major sources.

appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to

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[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

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[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or “tailings”) which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W.

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[5] http://www.epa.gov/radon/risk_assessment.html.

These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as “acid” or “alkaline” systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct

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[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind.

Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for “existing” impoundments, e.g., those in existence and licensed by the NRC (or it’s Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.[12]" Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

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[12] See 54 FR 51689.

The second standard applies to “new” impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 $pCi/m^2/s$ per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount

> necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of

hazardous constituents into the liner during the active life of the unit.

2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

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[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected.

[17] The term “beaches” refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres.

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[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 $pCi/m^2/sec$ will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 $pCi/m^2/sec$. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected

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[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total

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[26] See 54 FR 51656

cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC’s regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under

Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the ***Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document*** (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section

192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for Proposed Recordkeeping Requirements (Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*
Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach

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[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	\$0.013	\$0.010	\$0.0010
GACT – Liners for Heap Leach Piles	–	–	\$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	\$0.0043
GACTs – Total for All Four	\$1.05	\$3.08	\$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents

the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August

established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A	=	Radon attenuation factor (unit less)
λ	=	Radon-222 decay constant (sec^{-1})
	=	2.1×10^{-6} sec^{-1}
D	=	Radon diffusion coefficient (cm^2/sec)
	=	0.003 cm^2/sec in water
d	=	Depth of water (cm)
	=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33]

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as "process water" from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40

CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the

NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents

the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8)

increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC

the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new

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license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district

with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch

(Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore

Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond.

All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a “significant energy action” as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (“NTTAA”), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-

situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

EPA-3575

Sara Laumann

To

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Revisions to National Emission Standards for Operating Uranium Mill Tailings

United States Environmental Protection Agency

Notice of Proposed Rulemaking

Limits on Air Pollution from Uranium Mill Tailings

EPA limits emissions of hazardous air pollutants under the authority of the Clean Air Act. EPA's "National Emission Standards for Hazardous Air Pollutants (NESHAPS)" (40 CFR Part 61) set limits on hazardous air pollutants from different activities and facilities. Subpart W of 40 CFR Part 61, "National Emission Standards for Operating Uranium Mill Tailings," limits radon emissions from tailings at operating uranium mills. EPA originally issued Subpart W in 1989 (54 FR 51703, December 15, 1989).

Current Standards for Uranium Mill Tailings

The Subpart W standards limit the radon releases and doses to the public from the normal operations of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores. The facilities are commonly known as uranium mills and the byproducts as tailings. Subpart W currently has different requirements for byproduct material impoundments built before 1989 and those built afterward. Pre-1989 impoundments are subject to a numeric limit on radon emissions. Post-1989 facilities must control radon limits through one of the two following work practices:

1. No more than two impoundments may operate at any time and each cannot be larger than 40 acres. Disposal of tailings takes place in phases.
2. Disposal of tailings takes place continuously, and no more than 10 acres of tailings may be uncovered at any time.

The Rulemaking Process: From Laws to Environmental Standards

An environmental law is enacted when Congress passes it and the President signs it. Specific laws make EPA responsible for writing regulations which specify what must be done to obey the law. Many environmental regulations set standards that limit the amount of a hazardous material that can be discharged into the environment.

After an environmental law is enacted, EPA conducts a scientific analysis of the issues and, if necessary, proposes new or revised regulations in a *Notice of Proposed Rulemaking (NPRM)*. The proposal is listed in the *Federal Register* so that members of the public can consider it and send their comments to us. EPA will consider the comments received as it finalizes the regulations. The comments and EPA's response to them become part of the public record.

Final regulations are published in the *Federal Register* as a *Final Rule*, and added to the *Code of Federal Regulations (CFR).*

How You Can Participate

The public will have 90 days to submit comments on this *Notice of Proposed Rulemaking* starting the day of its publication in the *Federal Register*. All submissions will become part of the official public record for this rulemaking. Be sure to identify your submission by Docket ID No. EPA–HQ–OAR–2008-0218. You can submit comments by email, by regular mail, online or in person. Detailed instructions for submission of comments are in the *Notice of Proposed Rulemaking (NPRM)*. A link to the text is provided at: www.epa.gov/radiation

Why Revise the Standards?

The Clean Air Act Amendments of 1990 require EPA to review the standards of Subpart W periodically. After completing a recent review, EPA concluded that revisions were needed to clarify definitions and to be more specific about what kind of tailings impoundments are subject to the standard. EPA also concluded that requirements for generally available control technology (GACT) or management practices are the best means to control radon emissions from tailings piles. GACT are commercially available methods, practices and techniques for operation and maintenance of emissions control systems.

Key Changes in the Proposed Rule

Definition of Uranium Recovery Facilities: The proposed rule would apply to all operating uranium recovery facilities, which are defined as those facilities that manage uranium byproduct material or tailings, including conventional uranium mills, in-situ leach recovery facilities, and heap leach facilities. "Operating" means that an impoundment is being used for the continued placement of uranium byproduct material or tailings, or is in standby status.

GACT for All Conventional Impoundments, Regardless of Age: In the proposed rule, EPA would no longer have different standards for impoundments constructed before and after 1989. EPA is proposing that the work practices for impoundments built after 1989 would be required as GACT at all conventional impoundments, regardless of their age. Studies of the work practices have shown that they are effective in controlling radon releases to the environment. EPA proposes dropping the numeric radon standard for pre-1989 facilities because it is not needed when the GACT controls are in place.

GACT for Non-Conventional Impoundments: "Non-conventional" impoundments (commonly known as evaporation or holding ponds) hold uranium byproduct materials in ponds that are covered by liquids. In this proposed rule, EPA would require control of radon emissions by covering the tailings in the ponds with at least one meter of liquid at all times.

GACT for Heap Leach Piles: EPA is proposing to require operating heap leach piles to maintain a moisture content of 30 percent at all times. Studies have shown that 30 percent moisture content keeps radon emissions from heap piles at acceptable levels.

Construction Requirements for All Impoundments: The current Subpart W standard references other regulations that require impoundments to be designed, constructed and installed in a way that protects adjacent soils and waters. Specifications include top and bottom liners as well as a leachate collection and removal system. In the proposed rule, these requirements would apply to all types of uranium recovery facilities.

Recordkeeping Requirements: Under the proposed rule, uranium recovery facilities would have to maintain records to demonstrate compliance with requirements for impoundment construction, liquid coverage of ponds, and moisture content of heap leach piles.

EPA and Uranium Extraction Operations

EPA's mission is to protect human health and the environment. The Agency sets limits on the amount of radioactivity that can be released into the environment. EPA enforces the Clean Air Act requirements at Subpart W. The Nuclear Regulatory Commission (NRC) has regulatory responsibility for licensing and operation of uranium extraction facilities and other commercial facilities that use radioactive materials.

If enacted, this proposed rule would not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States.

Other Regulatory Agencies

U.S. Nuclear Regulatory Commission (NRC): The NRC regulates the civilian uses of nuclear materials in the United States by licensing facilities that possess, use or dispose of nuclear materials; establishing standards; and inspecting licensed facilities.

States: Most states have agencies responsible for regulating the use of radiation and radioactive emissions. Some states operate under agreement with the NRC to license and regulate certain types of radioactive materials.

EPA-3576

Sara Laumann

To

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- neshap_subpart-w_npr-final_-prepublication.pdf

This is the text of the Proposed Rule signed by Administrator Gina McCarthy on April 17,2014. Upon publication of this proposed rule in the Federal Register, this pre-publication version will be replaced with a link to the official Notice of Proposed Rulemaking. A 90-day public comment period will begin upon publication in the Federal Register.

ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to

this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-

1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990
CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256

TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) “in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In

[2] None of the sources in this source category are major sources.

appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is “facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.” 40 CFR 61.250. Subpart W defines “uranium byproduct material or tailings” as “the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to

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[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

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[4] The term “yellowcake” is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or “tailings”) which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W.

[5] http://www.epa.gov/radon/risk_assessment.html.

These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as “acid” or “alkaline” systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium

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[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is “rested,” meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the

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[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind.

Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: “This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.[12]” Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

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[12] See 54 FR 51689.

The second standard applies to “new” impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount

> necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of

hazardous constituents into the liner during the active life of the unit.

2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected.

[17] The term “beaches” refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres.

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[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for “Clean Air Act Assessment Package-1988 version 3.0,” is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

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[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected

[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total

[26] See 54 FR 51656

cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under

Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> “Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.”

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined “dewatered” tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section

192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for Proposed Recordkeeping Requirements (Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*
Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents

the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

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[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August

established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A	=	Radon attenuation factor (unit less)
λ	=	Radon-222 decay constant (sec^{-1})
	=	2.1×10^{-6} sec^{-1}
D	=	Radon diffusion coefficient (cm^2/sec)
	=	0.003 cm^2/sec in water
d	=	Depth of water (cm)
	=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33]

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment’s operator.

The most obvious source of water is what is known as “process water” from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no “process water” component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active “milling.” The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define “standby” as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of “Operation” for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that “operation” means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not “new tailings.” The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of “operation” in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40

CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the

NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule’s air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents

the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8)

increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC

the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new

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license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The

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[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility’s expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district

with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch

(Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore

Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond.

All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a “significant energy action” as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (“NTTAA”), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

* * * * *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-

situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

EPA-5235

Angelique Diaz

To

cc

bcc

Subject UPLOAD C:\Users\adiaz01\Documents\TELECOMMUTE\Subpart W\W WORKGROUP\SubWFOIAResponsiveDocuments\Subpart W NPRM.pdf

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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m²/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m²/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ⁷ cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m²/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8	Unit cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately \$15.3 million. When compared to the baseline capital costs associated with the facility (estimated at \$356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 $pCi/m^2/sec$.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

EPA-3042

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Notice of Subpart W Rulemaking.msg

- Notice of Subpart W Rulemaking.msg

EPA-3042

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Notice of Subpart W Rulemaking.msg

- Notice of Subpart W Rulemaking.msg

EPA-2986

Reid Rosnick

To	
cc	
bcc	
Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Notice of Subpart W Rulemaking.msg

- FW Notice of Subpart W Rulemaking.msg

EPA-3042

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Notice of Subpart W Rulemaking.msg

- Notice of Subpart W Rulemaking.msg

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, September 10, 2013 12:55 PM
To: Rosnick, Reid
Subject: Notice of Subpart W Rulemaking

Dear Reid,

Do you know about when the EPA will notice the Subpart W rulemaking? According to the last Subpart W review conference call, you expected it before the next call in October.

Thank you,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84532
435-259-9450

EPA-2986

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Notice of Subpart W Rulemaking.msg

- FW Notice of Subpart W Rulemaking.msg

From: Rosnick, Reid
Sent: Tuesday, September 10, 2013 4:44 PM
To: Miller, Beth
Subject: FW: Notice of Subpart W Rulemaking

Beth,

Can you please make the change from mid/late September to late October? Thanks

Reid

From: Rosnick, Reid
Sent: Tuesday, September 10, 2013 4:38 PM
To: 'sarah@uraniumwatch.org'
Subject: RE: Notice of Subpart W Rulemaking

Dear Sarah,

At this point we are continuing to respond to OMB and Interagency comments, but I am still hoping for an October publication. It would not be before the conference call, since it is on the 3rd. I will have the website changed to reflect this. Thank you.

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435-259-9450

EPA-3134

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Notice of Subpart W Rulemaking.msg

- RE Notice of Subpart W Rulemaking.msg

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PO Box 344
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435-259-9450

EPA-3133

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Notice of Subpart W Rulemaking (2).msg

- RE Notice of Subpart W Rulemaking (2).msg

From: Rosnick, Reid
Sent: Tuesday, September 10, 2013 5:41 PM
To: Miller, Beth
Subject: RE: Notice of Subpart W Rulemaking

Thanks!!

From: Miller, Beth
Sent: Tuesday, September 10, 2013 5:23 PM
To: Rosnick, Reid
Cc: Thornton, Marisa; Herrenbruck, Glenna
Subject: RE: Notice of Subpart W Rulemaking

Done
http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

Marisa can you please gov delivery this tomorrow (my password is expired) Thanks a bunch.

Beth

From: Rosnick, Reid
Sent: Tuesday, September 10, 2013 4:44 PM
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Subject: FW: Notice of Subpart W Rulemaking

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Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84532
435-259-9450

EPA-2950

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Deliverable.msg

- FW Deliverable.msg

From: Rosnick, Reid
Sent: Thursday, September 12, 2013 11:32 AM
To: Miller, Beth
Subject: FW: Deliverable

Beth,

Could you please put this in the Subpart W docket? Thanks

Reid

From: Abe Zeitoun [mailto:azeitoun@scainc.com]
Sent: Thursday, September 12, 2013 10:28 AM
To: Rosnick, Reid
Cc: Daigler, Valerie
Subject: RE: Deliverable

Good morning Reid,

Here is the document

Abe Zeitoun
SC&A S. Cohen & Associates
An Employee-Owned Company

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Wednesday, September 11, 2013 4:17 PM
To: azeitoun@scainc.com
Cc: Daigler, Valerie
Subject: Deliverable

Hi Abe,

I have been looking for a deliverable that SC&A produce a couple of years ago but I have not been able to find. It is:

SC&A 2010. "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions form Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds," Contract # EP-D-10-042, WA No. 1-04, Task 5, Nov 2010

Would you happen to have a copy you could send to me? Thank you.

Reid

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Risk Assessment Revision for
40 CFR Part 61 Subpart W –
Radon Emissions from Operating Mill Tailings

Task 5 – Radon Emission from Evaporation Ponds

Prepared by:

S. Cohen & Associates
1608 Spring Hill Road, Suite 400
Vienna, VA 22182

under

Contract Number EP-D-10-042
Work Assignment No. 1-04, Task 5

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Brian Littleton
Work Assignment Manager

November 9, 2010

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EXECUTIVE SUMMARY

The National Emission Standards for Hazardous Air Pollutants (NESHAPs) includes radon emissions for uranium mill tailings (40 CFR Part 61 Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings – December 15, 1989). At the time of promulgation, the overwhelming number of uranium processing facilities were conventional acid or alkaline leach mills. Radon emissions from these facilities were primarily from the dried out portions of large (greater than 100-acre) tailings ponds. With the promulgation of Subpart W, this large area source was reduced by the requirements to limit the size of new tailings areas to either 40 acres for phased disposal or 10 acres for continuous disposal (40 CFR 61 Subpart W). New facilities had to abide by these new tailings pond area limits. Additionally, and more importantly, economic and other considerations have lead commercial uranium recovery companies to submit license applications/amendments to develop, upgrade or restart a significant number of in-situ leach (ISL) facilities over conventional facilities.

Unlike conventional processes, ISL facilities do not produce tailings or other solid waste products. They do, however, generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, extraction solution (lixiviant), composed of groundwater enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes the uranium. The resulting “pregnant” lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field. This is accomplished by bleeding off a portion of the process flow. Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant wash down. One method to dispose of these liquid wastes is to evaporate them from ponds.

The water in these evaporation ponds can contain significant amounts of radon and radium, which will generate radon gas. This radon gas could escape from the pond, and result in exposures to individuals living nearby. The goal of this task is to develop a model that can be used to conservatively estimate the amount of radon that could be released from evaporation ponds to determine whether the ponds are a significant source of radon exposure to nearby individuals.

A review of the various models used for estimating radon flux from the surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model) coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond’s water and the assumption that radon is in secular equilibrium with the radium. Using this model, the radon flux from the surface of an evaporation pond, as a function of the wind speed (for winds less than 24 mph), can be estimated with the following equation.

$$J = \frac{1.48 \times 10^{-4}}{e^{-0.351V}} C_w \qquad \text{(ES-1)}$$

Where
- J = Radon flux (pCi/m^2-sec)
- C_w = Concentration of radium in the water (pCi/L)

V = Wind speed (m/sec)

Implicit in this model is the fact that in pond water, the radon diffusion coefficient is 10^{-5} cm^2/sec and that the thickness of the stagnant film layer can be estimated by an exponential relationship with wind speed.

Measurements conducted on the Homestake evaporation ponds agree with the stagnant film model estimates. However, the Homestake measurement method did not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data was found for measurements of the radon flux on evaporation ponds versus wind speed.

The model should not be used for wind speeds above 10 m/sec (24 mph). However, this is not expected to be a major limitation for estimating normal operational evaporation pond radon releases and impacts.

Using actual radium pond concentrations and wind speed data, Equation ES-1 was used to calculate the radon pond flux from several existing ISL sites. It was determined that the radon flux ranged from 0.07 to 13.8 pCi/m^2-sec. From this, it can be seen that the radon flux above some evaporation ponds can be significant (e.g., may exceed 20 pCi/m^2-sec). If this were to occur, there are methods for reducing the radium concentration in the ponds; the most straightforward being dilution. This, however, is temporary, as eventually evaporation will increase the concentration. A second method is to use barium chloride ($BaCl_2$) to co-precipitate the radium to the bottom of the pond. The radon generated at the depths of the bottom sediments will decay prior to reaching the pond surface.

Again using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from three sites. The evaporation pond contribution to the site's total radon release was small (i.e., <1%).

Two additional sources of radon release were investigated: 1) the discharge pipe, and 2) evaporation sprays. The discharge pipe is used to discharge bleed lixiviant to the evaporation pond. Radon releases occur when the bleed lixiviant exits the pipe and enters the pond. It was found that these radon releases are normally calculated using the NUREG-1569, Appendix D methodology, thus, this source is currently included in the total radon releases reported for an ISL site. Nonetheless, a simple scoping calculation showed that the discharge pipe radon release is larger (in some cases, much larger) than the radon releases once the waste water is in the evaporation pond.

Spray systems are sometimes used to enhance evaporation from the ponds. A model to calculate radon releases during spray operation was developed. Also, data from ISL ponds were used to estimate this source of radon release. The radon releases from spray operation were calculated to range from <0.01 to < 3 pCi/m^2-sec. Furthermore, operation of the sprays would reduce the radon concentration within the pond, hence, the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium).

1.0 INTRODUCTION AND BACKGROUND

The National Emission Standards for Hazardous Air Pollutants (NESHAPs) includes radon emissions for uranium mill tailings (40 CFR Part 61 Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings – December 15, 1989). At the time of promulgation, the overwhelming number of uranium processing facilities were conventional acid or alkaline leach mills. Radon emissions from these facilities were primarily from the dried out portions of large (greater than 100-acre) tailings ponds. With the promulgation of Subpart W, this large area source was reduced by the requirements to limit the size of new tailings areas to either 40 acres for phased disposal or 10 acres for continuous disposal (40 CFR 61 Subpart W). New facilities had to abide by these new tailings pond area limits. Additionally, and more importantly, economic and other considerations have lead commercial uranium recovery companies to submit license applications/amendments to develop, upgrade or restart a significant number of in-situ leach (ISL) facilities (NRC 2009) over conventional facilities.

Unlike conventional processes, ISL facilities do not produce tailings or other solid waste products. They do, however, generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, extraction solution (lixiviant), composed of groundwater enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes uranium (and other elements). The resulting "pregnant" lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field (NRC 2003, Appendix D). This is done by bleeding off a portion of the process flow, typically one to three percent of the process flow or a few tens of gallons per minute (gpm) to 100 gpm or more (NRC 2001, NRC 2003). Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant wash down. All of these liquid wastes may be disposed in an evaporation pond via permitted deep injection or by treatment to unrestricted release levels and disposed of by irrigation. This report focuses on disposal in an evaporation pond.

The water in these evaporation ponds can contain significant amounts of radon and radium, which will generate radon gas. In addition, some ponds may contain sediment which can also generate radon. This radon gas could escape from the pond and result in exposures to individuals living nearby. The goal of this task is to develop a model that can be used to conservatively estimate the amount of radon that could be released from the evaporation ponds, to determine whether the ponds are a significant source of radon exposure to nearby individuals.

To develop the evaporation pond radon release scenario, the following tasks were conducted:

- A review as to the important parameters governing radon release from water, including the general behavior of radon in water (Section 2.1);
- A review of measurements or estimates from models of radon and radon flux from the surface of various water bodies, including, but not limited to, tailings piles/ponds, lakes and oceans, and evaporation or settling ponds (Section 2.2);

- A review of the various models used for estimating radon flux from the surface of water bodies (Section 2.2);
- Selection of the model (Section 2.2.3) and parameters (Section 3.1) suited to evaporation ponds including modeling turbulent influence from the wind (Section 2.2.4);
- Review of current and past evaporation ponds/tailings, including using the joint frequency wind distribution to bound the problem (Section 3.2);
- Estimates of radon flux from selected evaporation pond configurations, including estimates from other sources such as discharge pipes (Section 3.3) and enhanced evaporation systems (Section 3.4).

Two measures were used to evaluate whether evaporation ponds are a significant source of radon at ISL sites:

- The estimated pond radon flux was compared to 20 pCi/m^2-sec, which is the Uranium Mill Tailings Radiation Control Act (UMTRCA, 40 CFR 192.32) standard for radon release when averaged over the entire tailing pile or impoundment. It is used in this report not as a radon release standard, per se, but as a guide to indicate whether the evaporation pond radon flux that has been calculated is significant.

- Using actual ISL site pond dimensions, pond radium concentration, and wind speed distribution, the model developed in this report was used to calculate the annual evaporation pond radon release. The calculated annual pond radon release was then compared to the total annual radon release for each site, as reported in site specific documents.

2.0 POND RADON EMISSION MODEL

For this task, SC&A has developed a model to bound radon emission from evaporation, holding, or settling ponds. In the discussion that follows, the term "evaporation ponds" includes holding and settling ponds, as well as evaporation ponds.

2.1 Sources of Radon in Pond Water

The following presents a basic review of some of the sources and properties of radon in water that influence the radon in evaporation ponds. Sources of radon in the water of an evaporation pond can include:

- Radon dissolved in the water (lixiviant) which passed through the ore body;
- Radon generated from radium containing sediment deposits on the bottom of the evaporation or holding pond;
- Radon from the decay of dissolved or suspended radium in the water; and
- Radon diffusing back into the water from the atmosphere.

The last of these four sources is considered to be negligible, while the first three sources are discussed further in the following sections.

2.1.1 Radon Dissolved from the Ore Body

The first source (radon in the water from an ISL facility) comes from the decay of radium in a solid matrix, likely the ore body, in addition to that dissolved in the water. The recoil range of a radon atom after radium disintegration is 30 to 50 nm in solids, 95 nm in water, and 64,000 nm in air (Lawrence 2005). The diffusion coefficient of radon in a solid matrix is 10-20 cm^2/sec, therefore, only those radon atoms produced in a layer 30 to 50 nm thick on the surface of solids will potentially enter the air or water pore spaces of sediments or soils. This limits the radon from the ore body. In the ore body, the ratio of the amount of radon in the pore space to the total amount of radon produced in a solid is the emanation coefficient. The emanation coefficient ("E") varies depending on the material (ranging from 1% to 80% and averaging 20% depending on the soil type), pore space, and water content (NRC 2001).

This source is also time dependent given the radon half life of 3.8 days. Should the water discharged to the evaporation pond be held up or delayed for any length of time, a fraction of the initial radon concentration would decay. However, in an ISL production well field, the movement of process water allows the radon to circulate and discharge before any significant decay reduction can occur.

Measurement of radon in groundwater at some ISL facilities ranges from 1.3×10^5 to 1.93×10^7 pCi/L (NRC 2001). The NRC assumed a concentration of 8×10^5 pCi/L in pregnant lixiviant for their risk analysis which approximates "the highest value reported inside a uranium recovery facility" (NRC 2001).

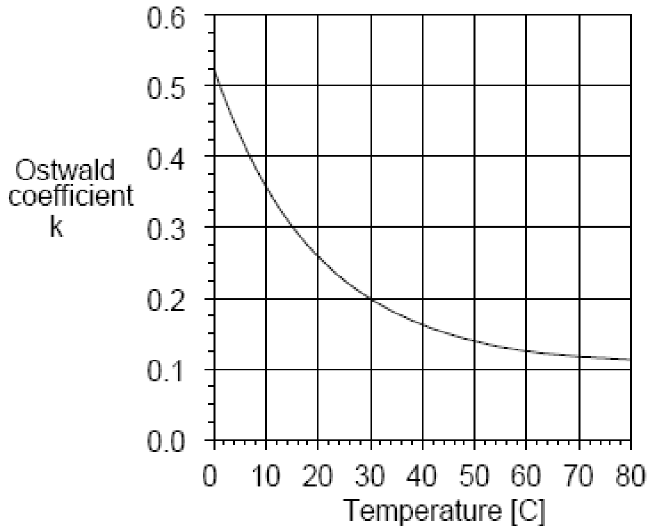
Investigations of radon in drinking water showed that over small distances there is often no consistent relationship between measured radon levels in groundwater and radium levels in the groundwater or in the parent bedrock (FR 64(38):9569). Radon's volatility is rather high compared to its solubility. Radon rapidly volatizes from surface water, therefore measured radon in surface water is often much lower than in groundwater. This is also the basis for the use of radon as an atmospheric tracer.

2.1.2 Radon Generated from Sediment Deposits

Radon generated from radium containing sediment deposits on the bottom of evaporation or holding ponds is also dependent on the emanation coefficient and the diffusion coefficient. A portion of the radon generated in the sediment, dependent on the emanation coefficient, will diffuse through the sediment layer. The thickness of the sediment layer, along with its diffusion coefficient, governs how much radon will be released to the overlying water layer. The radon diffusion coefficient in a fully saturated material is estimated at about 10^{-5} cm^2/sec. (ANL 1993)

2.1.3 Radon from Radium in the Water

Radon from the decay of dissolved or suspended radium in the water is also released to the atmosphere. While soluble in water, radon's solubility decreases with increasing temperature (Surbeck 1996). The Ostwald coefficient "k", defined as the ratio of the radon concentration in water to the radon concentration in air, decreases by over 250 percent from 0 °C to 40 °C, which is the range of temperatures expected in a uranium processing facility (see **Figure 1**).



Source: Surbeck 1996

Figure 1: Radon Water Solubility Versus Temperature (Ostwald Coefficient)

At constant temperature however, Henry's Law influences the release of radon from the water surface. That is, at constant temperature, the amount of radon released is proportional to the partial pressure of radon in equilibrium with the water. This is the basis for the stagnant film model discussed later.

2.2 Modeling Radon Emission from Water Bodies

2.2.1 Tailings and Tailings-Type Pond Models

A review of radon and radon flux from the surface of various water bodies, including, but not limited to, tailings piles/ponds, lakes and oceans, and evaporation or settling ponds was conducted to determine the probable range of radon and the potential for bounding the radon from an evaporation pond. These systems, which are similar to a lined evaporation pond, provide an overview of radon releases and should encompass the radon release from an evaporation pond.

Sears, Blanco, Dahiman, Hill, Ryan, and Witherspoon

One of the earliest published results was provided by Sears, et al. (ORNL 1975) from Oak Ridge National Laboratories as part of a series of reports documenting the cost of waste from the nuclear fuel cycle. Her group compiled and analyzed data from 15 operating mills during 1973 and 1974 and, using the data, developed two model mills: an acid leach mill and an alkaline leach mill. Each mill was assumed to have a capacity of 2000 tons per day ore processing and was assumed to run for 20 years, 365 days per year. The mills were located at two hypothetical sites, one in Wyoming and one in New Mexico. The Sears report presents a series of source terms for radon emanation from active tailings areas for the model mills at the end of their 20-year life. Radon releases from both ponds and dry active areas were considered. The pond source term included contributions from the tailings under the water cover, as well as radium dissolved in the pond water. They assumed that all of the radon diffusing from the tailings into the pond water plus all the radon from the decay of radium dissolved in the pond water was released to the atmosphere (i.e., the stirred-pond model). As Sears states, a "quiet-pond model, where some of the radon decays as it diffuses through the pond, would yield somewhat lower radon releases." (ORNL 1975, page 61) A portion of the ORNL 1975 results are presented in **Table 1**. As **Table 1** indicates, the pond radon release is about 0.0046 pCi/m^2-sec per pCi/L of radium dissolved in the pond's water. Since evaporation ponds are not expected to have large inventories of radium containing sludge on their bottoms, the contribution to the radon release from submerged tailings shown in **Table 1** is not expected to be applicable to evaporation ponds.

Table 1: Radon Release from Tailings Ponds

Case No.	Pond Type	Radium Pond Conc. (pCi/ml)	Radon Release (pCi/m^2-sec)[1]		
			Radium Decay	Submerged Tailings	Total
New Mexico Acid (Solvent) Extraction Mill					
1	Pond	1.7	7.8	9.0	16.8
2	Pond	1.7	7.8	9.0	16.8
3	Pond	2.3	10.5	9.0	19.6
4	Precip. Line pond	0.25	1.2	9.0	10.2
5	Precip. Line pond	0.25	1.2	9.0	10.2
Wyoming Acid (Solvent) Extraction Mill					
1	Pond	1.7	7.8	9.0	16.8
2	Pond	1.7	7.8	9.0	16.8
3	Pond	2.3	10.5	9.0	19.6
4	Precip. Line pond	0.25	1.2	9.0	10.2
5	Precip. Line pond	0.25	1.2	9.0	10.2
New Mexico Alkaline Leach Mill					
1	Pond	0.26	1.2	9.0	10.2
2	Pond	0.26	1.2	9.0	10.2
3	Pond	0.33	1.5	9.0	10.5
4	Precip. Line pond	0.088	0.4	9.0	9.4
5	Precip. Line pond	0.088	0.4	9.0	9.4

Table 1: Radon Release from Tailings Ponds

Case No.	Pond Type	Radium Pond Conc. (pCi/ml)	Radon Release (pCi/m^2-sec)[1]		
			Radium Decay	Submerged Tailings	Total
Wyoming Acid (Solvent) Extraction Mill					
1	Pond	0.26	1.2	9.0	10.2
2	Pond	0.26	1.2	9.0	10.2
3	Pond	0.33	1.5	9.0	10.5
4	Precip. Line pond	0.088	0.4	9.0	9.4
5	Precip. Line pond	0.088	0.4	9.0	9.4

Tailing in cases 4, 5 and 6 were chemically treated such as lime neutralization (acid leach) or copperas (alkaline leach) reducing the Ra-226 concentrations.

Source: ORNL 1975, Table 4.20

1. Units converted from pCi/day-cm^2 to pCi/m^2-sec for ease in comparing with other data.

Nielson and Rogers

A similar study was published in 1986 by K. K. Nielson and V.C. Rogers entitled "Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds" (Nielson 1986). In this study, the authors conducted a series of experiments using dried slime tailings from a mill (Rifle, Colorado UMTRAP site) placed into glass cylinders and covered with various depths of water. The radium-226 content of the slimes was about 4600 pCi/g. The dissolved component was 35 pCi/L Ra-226. The radon flux was measured from the water surface after circulating fresh air over the undisturbed water. Then the water was carefully siphoned off and additional flux measurements were taken over the saturated tailings. The results showed that diffusion did not account for all the radon transported from the water surface, and advective transport, likely thermally induced, dominated the observed radon flux. The authors state that the radon flux was four orders of magnitude greater than a radon flux governed by diffusion alone through the water. The measurement of flux with the water removed (saturated tailings) indicated no advective forces in the saturated material, only diffusion. In comparing their measured fluxes to radon fluxes calculated with a computer model, Nielson and Rogers found similar results.

The authors further analyzed a hypothetical tailings pile and separated the less than one meter of water-covered pond area from regions with greater than one meter of water cover. For the shallow-depth regions (less than one meter cover), visual dye tests indicate advective velocities result in almost no containment by the surface water. Thus, the radon flux from shallow water-covered tailings is nearly as great as that from bare saturated tailings.

For areas with water cover greater than one meter, they define an effective transport coefficient, which attenuates the radon generated in the covered tailings and from radon generated by radium in the water. These are "attenuated" or effectively transported up to the one-meter depth, where, as noted previously, there is almost no reduction in radon due to local advection.

In summary, the authors propose three contributors to the radon on the water surface: shallow, unsaturated tailings; deep, water saturated tailings and slimes, and radium dissolved in pond water. The applicable equation from Nielson and Rogers 1986 has been reproduced in Appendix A.

To use the equation, the authors selected nominal values for many of the required parameters, including bulk density, porosity, moisture saturations, surface area, and so on. Other parameters, such as emanation coefficient and diffusion coefficients for the unsaturated tailings, were based on site-specific data. The calculations presented are for the three contributors of tailings pond radon previously identified. **Table 2** presents their results for various states with uranium milling regions and were normalized to the radium content of the original ore.

Table 2: Specific Radon Fluxes from Six State Milling Regions for Three Components of a Uranium Tailings Impoundment (pCi/m^2-sec) / (pCi/g)

Tailings	State						Mean
	CO	NM	TX	UT	WA	WY	
Unsaturated	0.42	0.76	0.23	0.29	0.29	0.43	0.40
Saturated	0.036	0.062	0.031	0.027	0.031	0.035	0.037
Dissolved	0.020	0.033	0.019	0.017	0.019	0.020	0.022

Source: Nielson and Rogers 1986, Table IV

The table was used to further calculate the total daily radon emissions from each of these hypothetical ponds. Importantly, while the mean pond emissions are less than 5% of the total, they are not insignificant. Also, assuming an average ore grade of 0.1% U_3O_8 — or about 290 pCi/g Ra-226 — leads to a mean pond radon flux of 6.4 pCi/m^2-sec, which is comparable to the prior estimate by Sears, et al. (ORNL 1975) in **Table 1**.

World Information Service on Energy and Mudd

The Nielson and Rogers equation (see Appendix A) were put on the World Information Service on Energy (WISE) Uranium Project Internet site in 2002 (WISE 2002). Also, G.M. Mudd used the Nielson and Rogers model to estimate the radon flux from the Australian Ranger mill tailings pile (IAEA 2003). He estimated the radon flux as 20.25 pCi/m^2-sec from the above-ground dam (water depth 1.3 m), and 2.2 pCi/m^2-sec from the tailings repository in Pit # 1 (water depth greater than 10 m). These values are again comparable to the prior work.

Usman and Spitz

The role of advection in the transport of radon to the surface of ponds was also pointed out in work conducted by S. Usman and H. Spitz (IRPA 2004) who were investigating the long-term storage of radium-bearing sand at the Department of Energy's Fernald Ohio Site (also known as the K-65 tank waste) using a water barrier. The K-65 waste had extremely high concentrations of radium-226, with an average concentration of 391,000 pCi/g in silo 1, and 195,000 pCi/g in silo 2, which are orders of magnitude greater than a typical tailings pond. They conducted a series of laboratory experiments (with lesser concentrations of radium in the source material) and determined that advection played a role in the transport of radon through a water column. As stated in their paper, conventional values for molecular diffusion of radon in water range from 1.14×10^{-5} to 1.56×10^{-5} cm^2-sec^{-1}. Values observed in their study were 30 to 50 times greater: 5.14×10^{-4} to 8.14×10^{-4} cm^2-sec^{-1}. They attribute this to "radio-turbulence" from the energy released in the decay of radium to radon. Of importance to this work, however, is again the evidence that advection plays a role in radon from the surface of a "tailings type" pond.

2.2.2 Models for Other Water Bodies

The prior section focused on water bodies associated with uranium or uranium extraction, e.g., tailings piles and pits. As such, they have material on the bottom that contains radium which contributes to the surface flux. In larger bodies of water (oceans, lakes, etc.), the depth negates any such contribution. This is equivalent to an evaporation pond with no sediment on the bottom and is the focus of this section.

During the same period as the above tailings pond studies, a series of investigations into radon transport in water bodies was being conducted by oceanographers using radon as a tracer. The primary interest of these investigators was the exchange of gases over water bodies, particularly the exchange of carbon dioxide between the atmosphere and the ocean or lakes. B. Bolin was one of the first to investigate this gas transfer using the C^{14}/C^{12} ratio in the atmosphere and ocean (Bolin 1960). Bolin's model assumed a hypothetical boundary of water at the sea surface through which gas exchange is only by molecular diffusion. Building on Bolin's work, in 1971, W.S. Broecker and T.H. Peng proposed using radon to determine gas exchange rates on the open ocean (Broecker and Peng 1975). In this model, the atmosphere and water are viewed as two turbulent bodies separated by a thin unstirred, or stagnant, layer through which gases pass by molecular diffusion. As the water becomes more turbulent, the stagnant layer becomes thinner, and thus the gas exchange increases. Other researchers also measured radon from the ocean surface; for example, C. Duenas measured the radon flux directly at a location off the coast of Malaga Bay on the Spanish Mediterranean Coast (Duenas C. 1983). He also determined quantitative relations between the radon flux and the radon concentrations in the surface water with temperature and wind speed. The effect of wind speed is discussed in Section 2.2.4.

The basic model used by the above investigators is known as the classical stagnant film model, whose principal parameter is the transfer coefficient across the air-sea interface (Schwarzenbach, R.P., et al. 2003). The stagnant film model assumes the rate of transfer of gas between water and air is controlled by the thickness of a thin layer of water through which gas is transferred by molecular diffusion, that is, through a hypothetical film of stagnant water. The air above this film is assumed to be very well mixed. Similarly, the water below the film is assumed to be well mixed. The rate of gas exchange is dependent on the thickness of the film, which is in turn dependent on the degree of agitation of the surface. It follows that the greater the agitation due to wind on the surface, the thinner the thickness of the stagnant film layer. This concept is discussed further in Section 2.2.4.

At the same time as the stagnant film model was being applied to the transfer of gases between the ocean and the atmosphere, it was also being applied to smaller bodies of water, such as lakes. Emersin (1975) studied the radon exchange rate in three Canadian lakes that ranged in size from 3.5 to 5.5 hectares (35,000 to 55,000 m^2), with depths ranging from 7 to 10 m. Emerson shows that with the appropriate film thickness, the stagnant flow model radon exchange rates "conform reasonably well with the predictions made by wind tunnel experiments." Emerson's results are discussed further in Section 2.2.4. Broecker and Peng (1975) also applied the stagnant film model in their study of CO_2 exchange rates at three lakes in the western United States, ranging in size from 1.8×10^8 to 5.2×10^8 m^2. Finally, Chambers (2009) presents a pond radon flux model consisting of two release mechanisms: diffusion and turbulence (wave action). For the diffusion portion of his model, Chambers uses the stagnant film model, with a fixed film thickness. These studies demonstrate that the stagnant film model can be applied to water bodies other than the oceans.

2.2.3 Evaporation Pond Model Development

The concepts developed above were recently applied to current evaporation ponds by Baker and Cox (2010) and by Chambers (2009). The model used by both was the same as that discussed above, i.e., the stagnant film model, also known as the two bottleneck model (Schwarzenbach 2003). Using the model, Baker and Cox calculated the radon flux at the surface of a pond with dissolved radium and compared the results with charcoal canister measurements which were floated on the surface of the pond. They concluded that the 1.65 pCi/m^2-sec predicted by the model compares well with the mean measured flux of 1.13 pCi/m^2-sec. Following the Baker and Cox approach, Appendix B presents a derivation of the radon flux equation based on the bottleneck model and continuity of flux across the boundary. The basic equations and background may be found in Schwarzenbach (Chapter 19 – Bottleneck Boundaries). As noted therein, the flux across a two bottleneck boundary may be expressed as:

$$J = V_{tot}\left(\frac{C_a}{K_{aw}} - C_w\right)10 \qquad (1)$$

Where:	J	=	Radon flux	(pCi/m^2-sec)
	V_{tot}	=	Gas exchange velocity	(cm/sec)
	K_{aw}	=	Air-water partition coefficient	(dimensionless)
	C_a	=	Concentration of radon in the air	(pCi/L air)
	C_w	=	Concentration of radon in the water	(pCi/L water)
	10	=	Units conversion factor	(L/m^3) (m/cm)

The air-water partition coefficient (K_{aw}) estimated from the Henry's Law constant from NIST (NIST 2008) and conversion factors is:

$$K_{aw} = 4.35$$

From the previous discussion, the thickness of the stagnant air film and the stagnant water film can vary considerably. The selected diffusion coefficients for molecular diffusion of radon are about 10^{-5} cm^2/sec in water and 0.11 cm^2/sec in air. Baker estimated these film thicknesses as 100 microns for water and 1000 microns for air (0.01 cm and 0.1 cm). Substituting into the definitions for transfer velocities for water and air (see Appendix A):

$$V_w = \frac{D_w}{Z_w} = \frac{10^{-5}}{0.01} = 10^{-3}$$

And (2)

$$V_a = \frac{D_a}{Z_a} = \frac{0.11}{0.1} = 1.1$$

Where:	V_w	=	Transfer velocity for water	(cm/sec)
	V_a	=	Transfer velocity for air	(cm/sec)
	D_w	=	Diffusion coefficient for water	(cm^2/sec)
	D_a	=	Diffusion coefficient for air	(cm^2/sec)
	Z_w	=	Water film thickness	(cm)
	Z_a	=	Air film thickness	(cm)

However, the total transfer velocity is defined as:

$$V_{tot} = \frac{V_w\ V_a\ K_{aw}}{V_w + V_a\ K_{aw}} \qquad (3)$$

Noting that $V_a\ K_{aw} >> V_w$, means that the denominator can be approximated by $V_a\ K_{aw}$, which leads to:

$$V_{tot} \approx \frac{V_w\ V_a\ K_{aw}}{V_a\ K_{aw}} \approx V_w \qquad (4)$$

It is assumed that the atmospheric radon concentration is much less than the water radon concentration, or:

$$\frac{C_a}{K_{aw}} << C_w \qquad (5)$$

Then the flux (Equation 1) reduces to:

$$J = V_w\ C_w\ 10$$

$$= \frac{D_w}{Z_w}\ C_w\ 10 \qquad (6)$$

$$= 10^{-2}\ C_w \qquad (7)$$

Where	J	=	Radon flux	(pCi/m^2-sec)
	C_w	=	Concentration of radon in the water	(pCi/L)
	V_w	=	Transfer velocity for water	(cm/sec)
	D_w	=	Diffusion coefficient for water	(cm^2/sec)

	=	10^{-5}	(cm^2/sec)
Z_w	=	Water film thickness (see Section 2.2.4)	(cm)
	=	0.01	(cm)
10	=	Units conversion factor	(L/m^3) (m/cm)

Given a deep evaporation pond, for any sediment less than 2 meters below the surface, it is assumed the radon in the water is in secular equilibrium with the radium in the water. For a normalized concentration of radium in the water of 1 pCi/L, the flux is 0.01 pCi/m^2-sec. This flux matches the calculated radium normalized radon flux from Baker and Cox (2010), and compares favorably with the Baker and Cox (2010) measured normalized flux of 0.0068 pCi/m^2-sec and the 0.0058 pCi/m^2-sec radon flux due to diffusion given by Chambers (2009)[1]. This indicates that while the flux from an evaporation pond may be limited, it is not negligible.

Baker measured the radium concentration in an evaporation pond at the Homestake ISL facility at 165 pCi/L. Assuming a direct conversion to Rn-222 (165 pCi/L), the flux is estimated from Equation 7 at 1.65 pCi/m^2-sec. This is comparable to later measurements of the flux carried out by Baker, et al. using charcoal canisters. The average measured flux was 1.13 pCi/m^2-sec. This flux is also comparable to the flux calculated by Nielson and Rogers in the pond portion of a tailings pond (see **Table 2**), assuming an average ore grade of 0.1% U_3O_8 —or about 290 pCi/g Ra-226. The radon flux is 6.4 pCi/m^2-sec. This is also similar to the radon flux reported by Mudd (Section 2.2.1) of 2.2 pCi/m^2-sec from the tailings repository in Pit # 1 (water depth greater than 10 m) (IAEA 2003).

These values are the same order of magnitude in the Sears (ORNL 1975) Table (**Table 1**) for approximately the same order of magnitude of radium in the water.

Lastly, it is noted that the work conducted by Baker and Cox (2010) did not attempt to take wind speed into account. In fact, using the floating charcoal canisters on the pond surface insures that the wind on the surface being measured is zero, since the wind is blocked by the edge of the canisters flotation collar (Baker and Cox 2010). This can bias the radon flux results, as will be shown in the next section.

2.2.4 Modeling the Effects of Wind Turbulence

A number of researchers have investigated wind speed in conjunction with reduction in the film thickness and subsequent increase in the flux of gases from the surface (carbon dioxide, radon and so on). Schwarzenbach (2003) found that the thickness of the film layer is proportional to the inverse of the square of the average wind speed for winds greater than 2 m/sec in the open ocean. Broecker and Peng (1975) noted that at an average wind speed of 7 m/sec (12 knots or 13.8 mph), the film thickness was measured at 64 microns (64 µm), while when the average wind velocity was 12 m/sec (22 knots or 25.3 mph), the measured film thickness decreased to 20 microns, which follows the inverse squares prediction [i.e., 64 µm/20 µm ≈

[1] The flux reported by Chambers (2009) is actually 5.8×10^{-6} pCi/m^2-sec per pCi/L radium. However, he forgot to convert the radium concentration from pCi/L to pCi/m^3 before calculating the flux, so his reported flux is three orders of magnitude too low.

(12 m/sec)^2/(7 m/sec)^2]. This section presents a mathematical expression for estimating the influence of wind speed on radon flux.

Besides the work of Broecker and Peng (1975) and also Duenas (1983) previously mentioned, further investigations regarding wind speed and film thickness were published including a paper by Wanninkhof (1992). In this paper, Wanninkhof discusses and summarizes some of the questions of wind speed and gas exchange over the ocean. In a later paper, he and J. Crusius consider the question of gas transfer velocities measured at low wind speed over a lake (Crusius and Wanninkhof 2001). Again, the gas transfer velocity is the diffusion coefficient divided by the film thickness. Crusius and Wanninkhof (2001) present various published relationships between transfer velocities and wind speed. However, these relationships probably do not hold for bodies of water with surface areas as small as evaporation ponds.

Much of the prior research was conducted on the open ocean. An important paper for limited-area water bodies, like evaporation ponds, was the work of S. Emerson (Emerson 1975). He considered the influence of wind speed on the film thickness in Canadian Shield lakes. In the lake, Emerson used a limnocorral for his experiments; that is, a polyethylene curtain (a limnocorral) deployed in a lake such that it enclosed and "isolated" a triangular area in the top-most layer of a thermally stratified lake (the epilimnion). Thus a small area, rather than the entire lake surface, was investigated. This smaller area can be taken as analogous to an evaporation pond. He determined a "boundary layer" (film thickness) of about 600 microns from a series of three independent experiments conducted from1971 through 1972. Emerson noted that the relationship with wind speed breaks down for wind velocities below 2 m/sec (3.9 knots or 4.5 mph) and presented a plot compiling various researchers' data of film thickness versus wind speed. Figure 4 of his paper (reproduced as **Figure 2**) presents a compilation of his and other author's results, which includes stagnant boundary layer values from tank and wind tunnel experiments along with other measurements (Emerson 1975). Note that the wind speeds are all adjusted to the standard 10-meter height wind speed; see for example the measurements of Crusius (Crusius 2003) whose anemometer was at one meter and who used the conversion that the speed at 10 meters is equal to 1.22 times the speed at one meter.

To develop a mathematical expression for the influence of wind speed on the radon flux, a straight line was drawn through the semi-log plot of points on Emerson's Figure 4, as shown on **Figure 2**.

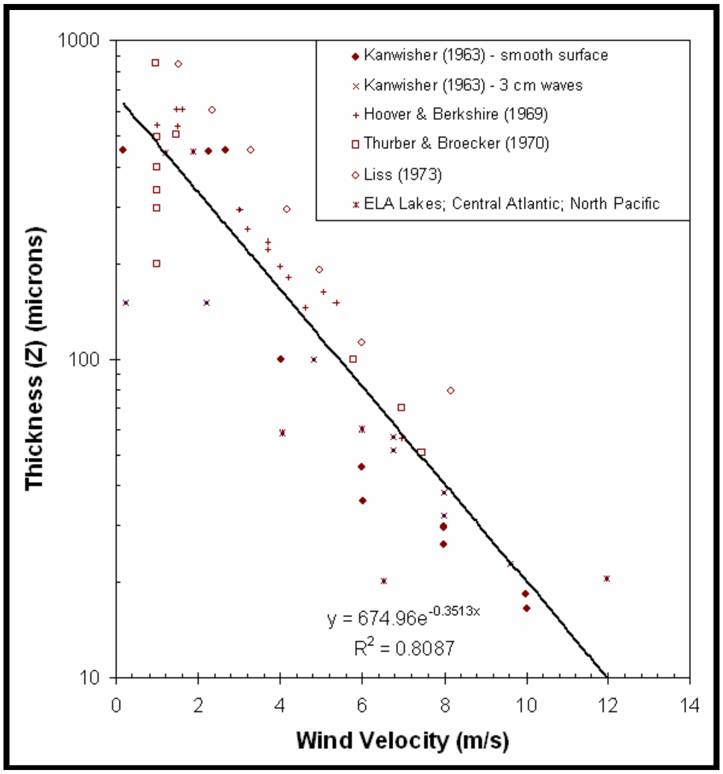


Figure 2: Boundary Layer Thickness Versus Wind Speed
(Based on Emerson 1975, Figure 4)

There is a fair amount of scatter in the points on this semi-log plot, which can result in considerable error. Both polynomial (square and cube) and exponential curves were fitted to the straight line on the figure. The exponential was selected, as polynomials were negative at high wind speed. It is important to note that this functional relationship is not part of a model or function having a physical basis. Rather, it is a mathematical construct. The exponential function was:

$$Z_w = 674.9 \exp(-0.351 * V) \quad (8)$$

Where: Z_w = film thickness (microns)
V = wind speed (m/sec)

As shown in **Figure 2**, Equation 8 has a coefficient of determination (R^2) equal to 0.8087, which indicates that about 81% of the variation in data points can be explained by Equation 8. A coefficient of determination of 81% is generally considered a good fit to the data.

Using Equation 8, the film thickness was determined, which was then entered into Equation 6. The resulting normalized radon fluxes (i.e., pCi/m^2-sec per pCi/L radium) are shown in **Table 3** for wind speeds ranging from 2 to 10 m/sec (4.5 to 22.4 MPH). **Table 3** indicates that the radon flux would increase by over an order of magnitude when the wind speed increases by a factor of five.

Table 3: Effect of Wind Speed on Pond Radon Release

Wind Speed @ 10 m		Film Thickness (µm)	Normalized Radon Flux* (pCi/m^2-sec)
(m/sec)	(MPH)		
2	4.5	335	0.0030
4	8.9	166	0.0060
6	13.4	82	0.012
8	17.9	41	0.025
10	22.4	20	0.050

* Per pCi/L radium.

Equation 8 was used to calculate the film thickness for conventional uranium mill and ISL facilities. Wind speeds for both conventional mill and ISL facilities are provided and discussed in Section 3.2.

As stated in Section 2.2.2, Chambers (2009) included turbulence (wave action) in his model of radon release from evaporation ponds. Chambers assumed that all of the radon produced by the decay of radium in the turbulent layer was released, and presented calculated radon fluxes of 0.0002 and 0.001 pCi/m^2-sec per 1 pCi/L of radium for turbulent layer thicknesses of 10 and 50 cm, respectively. There are two problems with this approach: 1) there is no guidance on how to select the turbulent layer thickness, and 2) compared to the **Table 3** results, the radon flux is low, probably due to limiting the radon generation to only the turbulent layer.

Although the stagnant film model that has been developed is limited to wind speeds that are less than about 10 m/sec, since most sites experience wind speeds that are this high or higher only a small portion of the time, this should not be a serious constraint for using the model to evaluate radon releases from evaporation ponds. For example, **Table 5** shows that for 11 existing or potential pond sites, the amount of time that the wind speed exceeds 10 m/sec ranges from <1% to <6%. Also, even if there was a high-speed wind event, the radon that could be released would be limited by the total amount that could be dissolved in the pond water (e.g., <1 Ci), after which it would require a period of time (one to two weeks) for the radon to re-equilibrate with the radium, during which time the pond's radon release would be depressed.

3.0 ESTIMATE OF EVAPORATION POND RADON RELEASE

This section presents estimates for three sources of radon: (1) from the surface of evaporation ponds based on the material in the prior sections, (2) from the direct discharge of "process bleed" lixiviant or purge water into the evaporation pond, and (3) from the spray of purge water into the evaporation pond. These are generic estimates. It is expected that the limits for each ISL evaporation pond will be determined on a case-by-case basis using site specific parameters. For each site, the number of ponds, and the flux from each pond, will be superimposed and used as the source term for the site and, ultimately, the dose. As discussed in Section 2.2.4, the wind speed plays a prominent role in determining the flux from an evaporation pond, which is dependent on the location of the facility.

3.1 Evaporation Pond Descriptions

This section presents an overview of evaporation ponds, their size, and the quantity of radium and radon in the water. According to the NRC (NRC 2009), typical evaporation ponds at ISL recovery operations have surface areas ranging from 0.1 to 6.2 acres (4,356 to 270,000 ft^2). However, based on the review presented below, the latter, larger area seems more typical of ISL operations.

For example, the original Crow Butte design report (WWC 1988) had five (5) evaporation ponds in an area adjacent to the ore body. Ponds 1, 2, and 5 had bottom dimensions of 850 × 200 ft = 170,000 ft^2, while ponds 3 and 4 were 700 × 250 ft^2, or 175,000 ft^2. Each pond was 15 feet deep, giving a total capacity of some 114 acre-feet, or about 37×10^6 gallons.

Twenty years later, at the same upgraded facility, Crow Butte (2009 NRC Inspection Report), during the period October 2008 through September 2009, there were three commercial ponds and two Research and Development (R&D) ponds. The commercial ponds (numbers 1, 3, and 4) had a 2:1 slope and were nominally 900 feet by 300 feet by 17 feet deep (area 270,000 ft^2 by 17 feet deep). The storage capacity of the pond system was 122.4 acre-feet or about 40×10^6 gallons, which is similar to the original design.

The ponds at the Christensen Ranch and the Irigaray Site are not as deep. At the Christensen Ranch, there are four ponds 100 feet by 400 feet by 9 feet with an operating capacity of 5.51 acre-feet each, or approximately 22 acre-feet altogether (7.1×10^6 gallons).

At the Irigaray Site, there are five lined evaporation ponds (see **Table 4**) and two lined restoration ponds (Areva 2008). The five lined evaporation ponds have a total capacity of 27.9 acre-feet, and were constructed in 1978 and 1979 under WDEQ Permit to Mine No. 478 and Source Material License SUA-1341. The two lined restoration ponds were constructed in 1979.

Table 4: Irigaray ISL Evaporation Ponds

ID	Size (ft)	Depth (ft)	Capacity (acre-feet)	Evaporation (acre-feet/yr)
A	100 × 390	6	6.3	6.12
B	250 × 250	6	6.3	6.03
C	100 × 390	6	6.3	6.12
D	250 × 250	6	6.3	6.02
E	100 × 250	6	2.7	2.73

Currently (May 2008), five of the ponds (Ponds A, C, D, E, and RA) have been decommissioned. The liners, leak detection system, and all contaminated materials have been removed and disposed of at the licensed Shirley Basin facility. The berms and supporting earthworks have been maintained intact. It is anticipated that a combination of ponds A, C, D, and RA will be re-installed as necessary to support the evaporative disposal of process water, up to 25 gpm, resulting from resumption of uranium recovery operations. Note that the depth of the ponds (about two meters) is still greater than the one-meter cutoff investigated by Neilson for influence of any bottom sediment.

At the Smith Ranch-Highlands facility, there are two small, lined solar evaporation ponds in operation. The capacity of each pond is 0.78 acre-feet of water. Each pond is 100 ft by 100 ft and 8 feet deep. During operations, a 3-feet freeboard is maintained in each pond to protect the berms from wave action due to winds. (PRI 2003)

3.2 Evaporation Pond Radon Release

To determine the average flux over the year, the joint frequency wind speed distributions were considered for three conventional uranium facilities and eight ISL facilities. **Table 5** presents the wind speed distribution for these sites. Each of the bins represents the wind speed summed over the sixteen compass directions. To calculate the flux, the center of each wind bin was determined and converted to meters/second. As is evident, the "windiest" location appears to be the Smith Ranch – Highland, with winds greater than 15.5 MPH for more than 45% of the time.

Table 5: Uranium Sites – Wind Speed Data Percentage in Each Wind Bin

		Wind Speed @ 10 meters					
	Wind "Bin" MPH	< 4	4 to 7	8 to 12	13 to 18	19 to 24	> 24
	Center of Bin MPH	1.5	5.5	10	15.5	21.5	28
	Center of Bin m/sec	0.7	2.5	4.5	6.9	9.6	12.5
Mill Type	**Site**	**Percentage of Wind Speed in Each Wind Bin**					
Conventional Uranium Mills	Sweetwater	19.5	21.6	22.3	20.7	10.9	5.1
	White Mesa	16.5	42.8	27.6	10.6	2.1	0.5
	Canon City	0.6	48.8	30.5	20.2	0.0	0.0
In-Situ Leach	Smith Ranch–Highland	5.7	21.1	28.2	26.1	13.2	5.7
	Crow Butte	10.3	29.0	30.2	22.0	7.4	1.9
	Crown Point	44.2	26.4	23.6	4.4	1.0	0.4
	Christenson/Irigaray	26.8	28.7	20.9	16.9	5.2	1.2
	Church Rock	44.2	26.4	23.6	4.4	1.0	0.4
	Alta Mesa 1,2,3	27.4	24.7	26.3	18.5	2.8	0.4
	Kingsville Dome 1,3	27.4	24.7	26.3	18.5	2.8	0.4
	Vasquez 1,2	27.4	24.7	26.3	18.5	2.8	0.4

Source: SCA 2010

From the above table and the exponential expression for film thickness versus wind speed, the film thickness (Z_w) was calculated for each wind speed bin. A normalized radon flux was determine for each wind speed (pCi/m^2-sec per pCi/L) using Equation 6, the diffusion coefficient for water ($D_w = 10^{-5}$ cm^2/sec), the aforementioned Z_w , and a radium concentration of 1 pCi/L.

As is evident, the normalize flux varies over a factor of two dependent on the wind speed and the percentage of time for each wind speed. For two wind speed bins, 0.7 m/sec and >12.5 m/sec, the film thickness versus wind speed functionality does not hold (Emerson 1975), so the film thicknesses for the adjacent bin was used in the flux calculation.

Figure 3 shows the results of the calculation for the three conventional mills and the eight ISL facilities. The facility with the greatest average wind speed also has the highest flux. Also, the ratio of the highest to lowest flux is somewhat less than a factor of three.

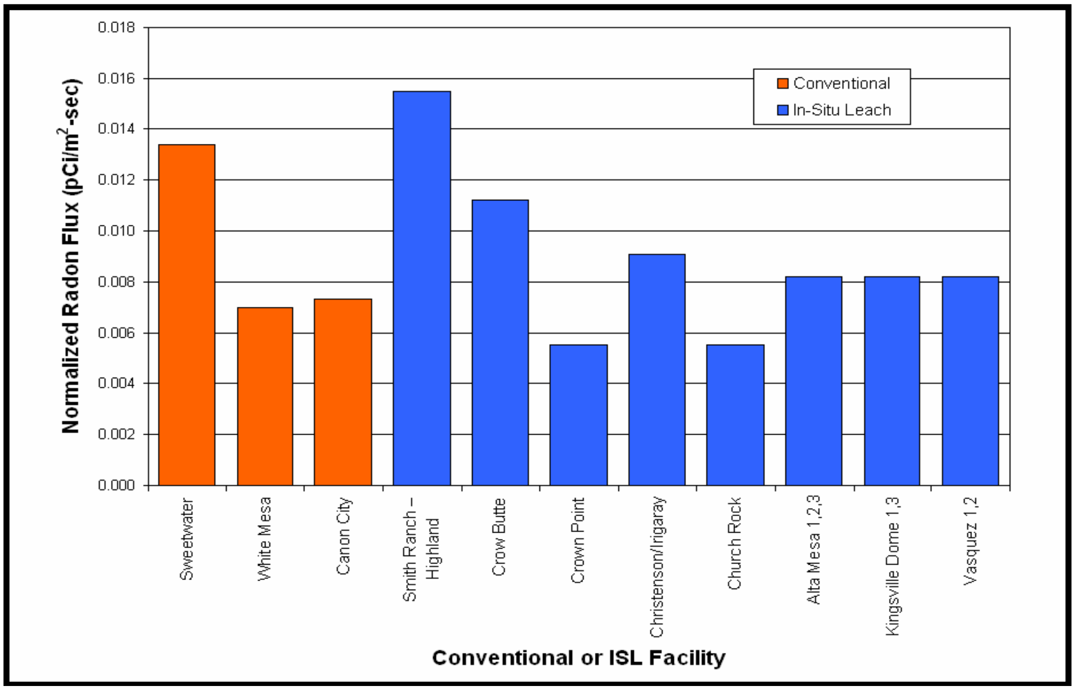


Figure 3: Normalized Radon Flux for Three Conventional and Eight ISL Uranium Facilities

Table 6 presents the radon flux for the aforementioned facilities for three radium in water concentrations, 1 normalized, 100 pCi/L and 1000 pCi/L. The fluxes at the largest concentration, while below the criteria, are not negligible.

Table 6: Radon Flux for Various Radium Concentrations

Mill Type	Radium Concentration (pCi/L)	1	100	1,000
	Site	Radon Flux (pCi/m^2-sec)		
Conventional Uranium Mills	Sweetwater	0.0134	1.34	13.4
	White Mesa	0.0070	0.70	7.0
	Canon City	0.0073	0.73	7.3
In-Situ Leach	Smith Ranch – Highland	0.0155	1.55	15.5
	Crow Butte	0.0112	1.12	11.2
	Crown Point	0.0055	0.55	5.5
	Christenson/Irigaray	0.0091	0.91	9.1
	Church Rock	0.0055	0.55	5.5
	Alta Mesa 1,2,3	0.0082	0.82	8.2
	Kingsville Dome 1,3	0.0082	0.82	8.2
	Vasquez 1,2	0.0082	0.82	8.2

Consider the flux from the Smith Ranch – Highland, which is about three times that from the Church Rock ISL. For the same radium concentration, say 1,500 pCi/L, the radon flux from a Smith Ranch – Highland evaporation pond would be 23.3 pCi/m^2-sec (which exceeds 20 pCi/m^2-sec), while the same radium concentration at Church Rock gives a radon flux of 8.3 pCi/m^2-sec (well below 20 pCi/m^2-sec). Thus, the radon flux is very dependent on wind environment, which is, in turn, dependent on the geographic location. Evaporation ponds located in calm areas can have higher concentrations of radium than those in windy areas. This is somewhat analogous to the situation of radon from soils. Soils with low porosity and tortuosity, such as clays, have low bulk diffusion coefficients versus sandy soils (7×10^{-3} cm^2/sec varved clay versus 6.8×10^{-2} cm^2/sec fine quartz, ORNL 1975). Thus, radium concentrations in different soils can be considerably elevated in these types of materials and still meet the 20 pCi/m^2-sec UMTRCA criteria.

To determine radon fluxes at various sites, the radium in the evaporation pond water was compiled from different sources for three sites. **Table 7**, **Table 8**, and **Table 9** present the reported radium-226 concentrations at the Christenson/Irigaray, Smith Ranch – Highland and the Crow Butte facility, respectively. Only the Christenson/Irigaray concentrations (**Table 7**) were measured directly in the ponds. The Smith Ranch – Highland concentrations (**Table 8**) were measured at the discharge from the radium treatment system, which would also be the concentration of the water entering the evaporation ponds. For the Crow Butte site, it was assumed that the radium concentration entering the ponds would be the same as the radium concentration for water injected into the deep disposal wells (**Table 9**).

Table 7: Christenson/Irigaray Evaporation Pond Radium Concentration

Pond ID #	Radium (pCi/L)				
	04/19/09	05/21/09	08/18/09	11/11/09	Average
IR-B	141	191	131	152	154
IR-RB	3.5	2.4	N/D	21	9
CR-1	87.3	182	205	104	145
CR-2	63.8	75.7	60.2	46	61
CR-3	69.7	47.3	57.7	87	65
CR-4	152	101.7	133.3	136	131

Source: COGEMA 2010, Table 1

Table 8: Smith Ranch – Highland Evaporation Pond Radium Concentration

Date	Radium (pCi/L)		Date	Radium (pCi/L)	
	No. 2	No. 3		No. 2	No. 3
Jan-09	7.5	3.3	Jan-10	1.1	65
Feb-09	3.2	32	Feb-10	3.8	1.5
Mar-09	18	8.5	Mar-10	1.5	48
Apr-09	0.95	4.8	Apr-10	1.5	1.8
May-09	2.5	32	May-10	11	23
Jun-09	6	3.4	2010 Ave	4	28
Jul-09	3.4	3.4	2009 and 2010 Average	4	20
Aug-09	5	27			
Sep-09	3.9	6			
Oct-09	2.7	0.29			
Nov-09	0.77	N/D			
Dec-09	1.2	3.3			
2009 Ave	5	11			

Source: PRI 2010, Tables 7-11 and 7-12

Table 9: Crow Butte Evaporation Pond Radium Concentration

Date	Radium (pCi/L)	Date	Radium (pCi/L)
Jan-07	1,060	Jul-07	856
Feb-07	1,200	Aug-07	782
Mar-07	1,030	Sep-07	974
Apr-07	1,090	Oct-07	788
May-07	918	Nov-07	820
Jun-07	1,000	Dec-07	1,230
Average (pCi/L)			980

Source: CBR 2007a, Appendix D and CBR 2008, Appendix D

These radium concentrations vary from 4 pCi/L to 980 pCi/L, indicating the large range of lixiviant and/or the potential of dilution from other contributors of water to the evaporation ponds. Smith Ranch – Highlands is at the low end of the range, likely due to its use of a barium chloride treatment system to reduce the radium concentrations (see Section 3.5). Smith Ranch – Highlands notwithstanding, it is expected that the radium content would be in the 100's to 1000's pCi/L range at most ISL sites. These values for radium in the water are less than or comparable to those used to calculate risk from ISL facilities in a 2001 NRC review (NRC 2001). The assumed radium-226 activity in the pregnant lixiviant in that study was 3,400 pCi/L of radium-226.

Using the normalized fluxes previously calculated, the radon flux for each of the evaporation ponds are presented in **Table 10**. The fluxes for the most part are low, however, they are not negligible. For Crow Butte, the flux is a factor of ten higher than the others, reflecting the elevated radium content in the evaporation pond. On the other hand, for Smith Ranch – Highlands, the radium content is low due to the radium treatment system.

Table 10: Radon Flux at the Christenson/Irigaray, Smith Ranch – Highland and Crow Butte Facilities

Facility	Pond ID	Radon Flux (pCi/m^2-sec)	
		Average	Maximum
Crow Butte	1, 3, or 4	11.0	13.8
Christenson/Irigaray	IR-B	1.40	1.74
	IR-RB	0.08	0.19
	CR-1	1.31	1.86
	CR-2	0.56	0.69
	CR-3	0.59	0.79
	CR-4	1.19	1.38
Smith Ranch-Highland	No. 2	0.07	0.28
	No.3	0.25	1.01

As a last comparison, the calculated annual radon released from the evaporation ponds was compared to total site reported radon releases. For Crow Butte, the facility total radon releases to the environment for 1995 through 2006 are given in the license renewal application (CBR 2007b, Table 5.8-8). For Christenson/Irigaray, the total facility radon releases for 1995 through 2000 are given in license renewal application (COGEMA 2008, Table 5.13). For Smith Ranch – Highlands, the facility total radon release was taken from Section 4.1.2 of the source material license application (PRI 2003). As shown by **Table 11**, the calculated evaporation pond radon release is less than 1% of the facility total radon releases for each of the three sites analyzed.

Table 11: Comparison of Calculated Evaporation Pond Radon Emissions to Reported Facility Total Radon Emissions

Facility	Radon Release (Ci/yr)		Pond Fraction of Facility Total
	Facility Total*	Pond	
Crow Butte	3,537 to 4,760	26.2	0.59%
Christenson/Irigaray	649 to 1,454	0.70	0.07%
Smith Ranch—Highlands	6,738	0.009	<0.001%

* Source: Crow Butte: CBR 2007b, Table 5.8-8
Christenson/Irigaray: COGEMA 2008, Table 5.13
Smith Ranch-Highlands: PRI 2003, Section 4.1.2

3.3 Direct Discharge Radon Release

Another source or radon is the point source from radon in the water being transferred to the surface of the pond, called the bleed lixiviant, process bleed, or purge water. As previously stated, the bleed lixiviant is necessary to maintain a hydraulic cone of depression around each well field to prevent leakage of mining solutions outside the production zone. The radon in the bleed lixiviant is assumed to be the same as that in the pregnant lixiviant. The radon in this lixiviant ranges in various studies from 1.3×10^5 pCi/L to 1.93×10^5 pCi/L (NRC, 2001). The transferred amount, that is the amount that goes into the atmosphere during the discharge process, can be estimated from studies of the transfer of radon in the home from water containing dissolved radon. The transfer coefficient is defined as the ratio of the average incremental concentration throughout a house to the average concentration in water. The transfer coefficient is really of value only to the release of radon in a closed area within the processing facility. It does not hold for an open system such as the discharge pipe. However, the transfer efficiency, which is the fraction of radon in the water that is released to the air during activities such as showering, clothes washing or other water-moving activities, is similar to discharge. The weighted average of measurements by various researchers of this radon transfer efficiency was 0.52 (NAS 1999).

NRC has also considered this source in NUREG-1569 Appendix D (NRC, 2003). Their hypothesis is that almost all the radon in the purge lixiviant is readily released to the atmosphere as versus the radon transfer efficiency of 52%. The amount of radon available for release is dependent on the water volume purge rate and the concentration of radon in the water. For a "typical" ISL, NRC assumes the radon concentration in the purge water is 3.2×10^5 pCi/L, which is in the range discussed previously. The purge rate was taken as 5.5×10^5L/d or about 100 gpm. This purge rate is very conservative. For example, the purge rate at the Irigaray Site is about 25 gpm. The radon released per year can be calculated from

$$Rn = 3.65 \times 10^{-10} \text{ (Ci/pCi)(d/y)} \times (3.2 \times 10^5 \text{ pCi/L}) \times 5.5 \times 10^5 \text{L/d} \quad (9)$$

or

$$Rn = 64 \text{ Ci/year}$$

It is noted that continual (365 days per year) processing is assumed to occur. While this release can be used to estimate source terms for dose calculations, it cannot be used for flux estimates, as the area is unknown and any assumed area (such as the evaporation pond area) is arbitrary with no physical basis.

3.4 Enhance Evaporation Sprays Radon Release

In order to reduce the size of the evaporation ponds, some ISL facilities utilize enhanced evaporation systems, see **Figure 4**.

Figure 4: Sprays Used to Enhance Evaporation

It is expected that any radon contained within the pond water that is sprayed into the air would be released.

At equilibrium, with the sprays functioning, the radon activity within the evaporation ponds can be calculated by Equation 10.

$$\frac{dA'_{Rn}}{dt} = \lambda_{Ra} A'_{Ra} - \lambda_{Rn} A'_{Rn} - f_s A'_{Rn} = 0 \tag{10}$$

Where:	A'_{Rn}	=	Radon-222 activity in the pond	(atoms)
	A'_{Ra}	=	Radium-226 activity in the pond	(atoms)
	λ_{Ra}	=	Radium-226 decay constant	(sec^{-1})
	λ_{Rn}	=	Radon-222 decay constant	(sec^{-1})
	f_s	=	Fractional radon release rate	(sec^{-1})
		=	$\frac{F_s}{V_p}\varepsilon$	
	F_s	=	Spray flow rate	(L/sec)
	V_p	=	Pond volume	(L)
	ε	=	Spray radon removal efficiency (dimensionless)	

Solving Equation 10 and converting from atoms to Curies gives:

$$A_{Rn} = \frac{\lambda_{Rn} A_{Ra}}{\lambda_{Rn} + f_s} = \frac{\lambda_{Rn} C_{Ra} V_p}{\lambda_{Rn} + f_s} \tag{11}$$

Where:	A_{Rn}	=	Radon-222 activity in the pond	(Ci)
	A_{Ra}	=	Radium-226 activity in the pond	(Ci)
	C_{Ra}	=	Radium-226 concentration in the pond	(Ci/L)

All others terms have been previously defined.

Notice that when the spray system is turned off (i.e., $f_s = 0$), Equation 2 results in the radon activity (or concentration) (A_{Rn} or C_{Rn}) being equal to the radium activity (or concentration) (A_{Ra} or C_{Ra}), as would be expected.

The radon release (R_{Rn}) due to the sprays may be calculated from Equation 12.

$$R_{Rn} = A_{Rn}\, f_s = \frac{\lambda_{Rn} C_{Ra} V_p f_s}{\lambda_{Rn} + f_s} = \frac{\lambda_{Rn} C_{Ra} F_s \varepsilon}{\lambda_{Rn} + f_s} \tag{12}$$

All terms have been previously defined.

To demonstrate the effect of using a spray system to enhance evaporation on radon release, the ponds shown in **Table 12** were evaluated using Equation 12. Note, while the dimensions shown on **Table 12** are for actual ISL evaporation ponds, the actual ponds do not necessarily use, or contain, spray systems.

Table 12: Evaporation Pond Dimensions

Site	Pond ID	Length (ft)	Width (ft)	Depth (ft)	Volume (V_p) (L)
Irigaray	I-1	100	250	6	4.2E+06
Irigaray	I-2	100	390	6	6.6E+06
Christensen Ranch	CR-1	100	400	9	1.0E+07
Irigaray	I-3	250	250	6	1.1E+07
Crow Butte	CB-1	850	200	15	7.2E+07
Crow Butte	CB-2	700	250	15	7.4E+07
Christensen Ranch	CR-2	900	300	17	1.3E+08

The values assumed for the other parameters needed to solve for the amount of radon released due to the operation of the sprays are shown in **Table 13**.

Table 13: Parameters Used to Estimate Spray System Radon Release

Parameter	Case 1	Case 2	Case 3	Case 4	Units
Radon-222 half-life	3.823				days
Radon-222 decay constant (λ_{Rn})	2.1E-06				sec^{-1}
Spray radon removal efficiency (ε)	1	1	1	0.8	—
Radium-226 concentration in the pond (C_{Ra})	600	600	300	600	pCi/L
Spray flow rate	100	1,000	100	100	gpm
Spray flow rate (F_s)	6.31	63.1	6.31	6.31	L/sec

For the spray removal efficiency, Rost (1981) demonstrated the ability of spray aeration to remove radon from water. Depending upon the spray arrangement used, spray aeration achieved between 76% and 93% radon removal. Because of these high removal rates, and because it is conservative, a 100% radon removal has been assumed for three of the four cases analyzed. For the fourth case, a nominal 80% radon removal has been assumed. The second case shows the effect of increasing the spray flow rate by an order of magnitude, while the third case shows the effect of increasing the Ra-226 concentration in the water entering the pond. Note, for this analysis credit was not taken for either the buildup of radium in the pond nor for the removal of radium due to the addition of barium chloride to the pond water.

The results for the four cases analyzed are shown in **Table 14**.

Table 14: Calculated Radon Releases Due to Enhanced Evaporation Sprays

Pond ID	Case 1				Case 2			
	f_s (sec^{-1})	C_{Rn} (pCi/L)	R_{Rn} (pCi/sec)	R_{Rn} (pCi/m^2-sec)	f_s (sec^{-1})	C_{Rn} (pCi/L)	R_{Rn} (pCi/sec)	R_{Rn} (pCi/m^2-sec)
I-1	1.5E-06	351	2,217	0.95	1.5E-05	74	4,686	2.02
I-2	9.5E-07	413	2,604	0.72	9.5E-06	108	6,836	1.89
CR-1	6.2E-07	463	2,923	0.79	6.2E-06	152	9,585	2.58
I-3	5.9E-07	468	2,950	0.51	5.9E-06	157	9,880	1.70
CB-1	8.7E-08	576	3,634	0.23	8.7E-07	424	26,726	1.69
CB-2	8.5E-08	577	3,638	0.22	8.5E-07	427	26,953	1.66
CR-2	4.9E-08	586	3,700	0.15	4.9E-07	487	30,743	1.23

Table 14: Calculated Radon Releases Due to Enhanced Evaporation Sprays

Pond ID	Case 3				Case 4			
	f_s (sec^{-1})	C_{Rn} (pCi/L)	R_{Rn} (pCi/sec)	R_{Rn} (pCi/m^2-sec)	f_s (sec^{-1})	C_{Rn} (pCi/L)	R_{Rn} (pCi/sec)	R_{Rn} (pCi/m^2-sec)
I-1	1.5E-06	176	1,108	0.48	1.2E-06	383	1,933	0.83
I-2	9.5E-07	206	1,302	0.36	7.6E-07	440	2,222	0.61
CR-1	6.2E-07	232	1,462	0.39	5.0E-07	485	2,450	0.66
I-3	5.9E-07	234	1,475	0.25	4.8E-07	489	2,469	0.43
CB-1	8.7E-08	288	1,817	0.12	7.0E-08	581	2,931	0.19
CB-2	8.5E-08	288	1,819	0.11	6.8E-08	581	2,933	0.18
CR-2	4.9E-08	293	1,850	0.074	3.9E-08	589	2,973	0.12

Table 14 shows that even with a relatively large spray flow rate (1,000 gpm), the radon release rate is small (≤2.58 pCi/m^2-sec), or ≤0.0043 pCi/m^2-sec per pCi/L of radium in the pond water. For the largest and smallest ponds analyzed, **Figure 5** shows the effect of varying the spray flow rate on the radon release rate. As shown, the radon release from the large and small ponds becomes asymptotic 0.011 and 0.0038 pCi/m^2-sec per pCi/L of radium, respectively. For a pond radium concentration of 1,000 pCi/L, the large and small pond radon releases become asymptotically 11 and 3.8 pCi/m^2-sec, respectively. These fluxes are similar in order of magnitude to those from high-wind areas previously discussed.

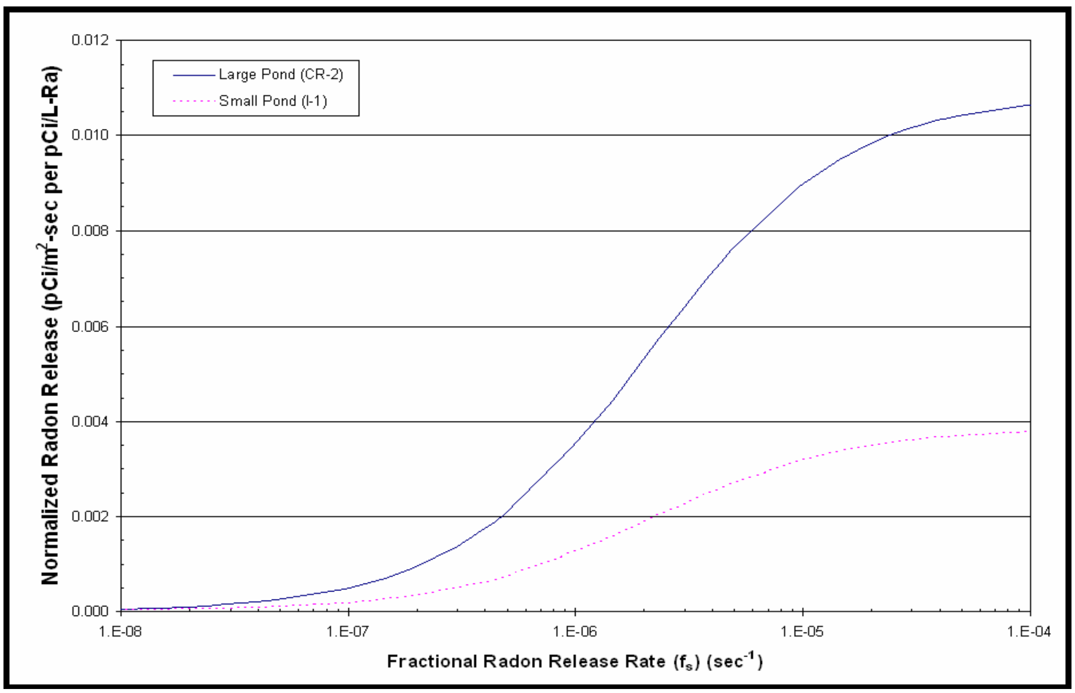


Figure 5: Effect of Spray Flow on Radon Release

3.5 Barium Chloride Treatment to Control Radium

Water entering the evaporation ponds exits the ponds via evaporation, however, radium does not evaporate, and thus builds up to concentration levels that can exceed the concentration of radium in the water entering the ponds. This buildup of radium would result in higher radon releases due to water to air transfer, as well as sprays used to enhance evaporation. In order to reduce radium pond concentrations, barium chloride ($BaCl_2$) is often added to the water. Co-precipitation of radium occurs when natural sulfate (SO_4) in the water combines with radium (Ra) and barium (Ba) to form $RaBaSO_4$ (Powertech 2009).

> Barium chloride ($BaCl_2$) treatment is widely used in the uranium industry to remove radium at mining sites. Radium concentrations below 8.1 pCi/L (0.3 Bq/L) can easily be achieved for wastewater containing sulfate ions. At pH values between six and eight, barium sulfate ($BaSO_4$) has a low solubility and readily precipitates out, co-precipitating radium at the same time. Only 0.00007–0.00013 lb (30–60 mg) of barium chloride per liter of wastewater will achieve 95–99 percent removal of radium. (EPA 2006)

Table 15 shows the effectiveness of barium chloride at removing radium from the Church Rock/Crown Point sample mine water. This reflects the 95% to 99% radium removal efficiency for barium chloride given by the EPA (EPA 2006).

Table 15: Hydro Resources, Inc. Data on Barium Chloride Treatment for Removing Radium from Wastewater

Test	$BaCl_2$ Concentration (mg/L)	Final Radium Concentration (pCi/L)
Test 1	0.0 (waste stream)	74.0
	10.5	0.21
	14.0	0.24
	17.5	0.24
Test 2	0.0 (waste stream)	73.4
	10.5	0.66
	14.0	0.28
	17.5	0.40
Test 3	0.0 (waste stream)	73.4
	14.0	0.20
	17.5	0.64

Source: NUREG- 1508, Table 2.3

Once the radium has precipitated out of the water, it will settle on the pond bottom. Because of the depth of evaporation ponds, radon produced from the precipitated radium would decay before it could be released from the ponds surface. This would only become problematic at the end life of the pond when the water is evaporated out and the pond sediment removed.

4.0 CONCLUSIONS

A review of the various models used for estimating radon flux from the surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model), coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond's water and the assumption that radon is in secular equilibrium with the radium. Using this model, the radon flux from the surface of an evaporation pond, as a function of the wind speed, can be estimated with the following equation.

$$J = \frac{1.48 \times 10^{-4}}{e^{-0.351V}} C_w \qquad (13)$$

Where

J	=	Radon flux	(pCi/m^2-sec)
C_w	=	Concentration of radium in the water	(pCi/L)
V	=	Wind speed	(m/sec)

Implicit in this model is the fact that in pond water, the radon diffusion coefficient is 10^{-5} cm^2/sec and the thickness of the stagnant film layer can be estimated from Equation 8.

Measurements conducted on the Homestake evaporation ponds by Baker and Cox (2010) agree with the stagnant film model estimates. However, as pointed out previously, the Baker and Cox (2010) measurement method does not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data was found for measurements of the radon flux on evaporation ponds with the wind blowing.

The model should not be used for wind speeds above 10 m/sec. However, for the reasons given in Section 2.2.4, this is not expected to be a major limitation for estimating normal operational evaporation pond radon releases and impacts.

Using actual radium pond concentrations and wind speed data, Equation 13 was used to calculate the radon pond flux from several existing ISL sites. It was determined that the radon flux ranged from 0.07 to 13.8 pCi/m^2-sec (see **Table 10**). From this, it can be seen that the radon flux above some evaporation ponds can be significant (e.g., may exceed 20 pCi/m^2-sec). If this were to occur, there are methods for reducing the radium concentration in the ponds, the most straightforward being dilution. This, however, is temporary, as eventually evaporation will increase the concentration. A second method is barium chloride precipitate discussed in Section 3.5. The barium chloride will co-precipitate the radium to the bottom of the pond. As shown previously, radon generated at these pond depths will decay prior to reaching the surface.

Again, using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from the site. As **Table 11** shows, the evaporation pond contribution to the site's total radon release is small (i.e., <1%).

Two additional sources of radon release were investigated: 1) the discharge pipe, and 2) evaporation sprays. The discharge pipe discharges bleed lixiviant and liquid waste from the processing plant to the evaporation pond. Radon releases occur when the waste water exits the pipe and enters the pond. These radon releases can be estimated using the NUREG-1569, Appendix D methodology, thus, this source is currently included in the total radon releases reported for an ISL site. Nonetheless, a simple scoping calculation in Section 3.3 shows that the discharge pipe radon release is typically larger than the radon releases once the waste water is in the evaporation pond.

Spray systems are sometimes used to enhance evaporation from the ponds. In Section 3.4 a model to calculate radon releases during spray operation was developed. Section 3.4 also used data from ISL ponds to estimate this source of radon release. The radon releases from spray operation were calculated to range from <0.01 to < 3 pCi/m^2-sec (see **Table 14**). Furthermore, operation of the sprays would reduce the radon concentration within the pond, so that the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium).

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APPENDIX A: NIELSON AND ROGERS RADON FLUX MODEL

Equation 3 from Nielson and Rogers 1986 can be used to calculate the radon flux from a pond due to three sources: shallow tailings, deep tailings, and dissolved radium. Nielson and Rogers 1986, Equation 3 has been reproduced as Equation A-1.

$$J = 10^4 \, R \, \rho \, E \sqrt{\lambda D} \, \left[f_S + (1 - f_S) A_t \right] + 10^6 \, R_w \, \lambda \, S_d \, (1 - 0.5 f_S) \qquad \text{(A-1)}$$

Where:				
	J	=	Radon flux from the exposed pond surface	(pCi/m^2-sec)
	R	=	Solids radium content	(pCi/g)
	ρ	=	Bulk solid density	(g/cm^3)
	E	=	Radon emanation coefficient for solids	(dimensionless)
	λ	=	Radon decay constant	(sec^{-1})
	D	=	Radon diffusion coefficient in pore water	(cm^2/sec)
	f_S	=	Fraction of pond area with less than 1 m deep	(dimensionless)
	A_t	=	Attenuation factor for deep water	(dimensionless)
		=	$e^{\sqrt{\lambda / D_{tr}}\,(X_p - 100)}$	
	D_{tr}	=	Effective stagnant water transport coefficient	(cm^2/sec)
		=	0.003	(cm^2/sec)
	X_p	=	Average pond depth for areas greater than 1 m	(cm)
	R_w	=	Water radium content	(pCi/cm^3)
	S_d	=	Depth of surface layer from which all radon is assumed to be released	(m)
		=	1	(m)
	10^4	=	Conversion factor	(cm^2/m^2)
	100	=	Depth above which attenuation does not occur	(cm)
	10^6	=	Conversion factor	(cm^3/m^3)

APPENDIX B: FLUX FROM AN EVAPORATION POND

This appendix provides the derivation of the flux from the two bottleneck boundaries (also called the bottleneck boundary between two different media) for the model used by Baker as presented in (Schwarzenbach, R.P., et al. 2003).

Figure B-1 presents a diagrammatic sketch of the system.

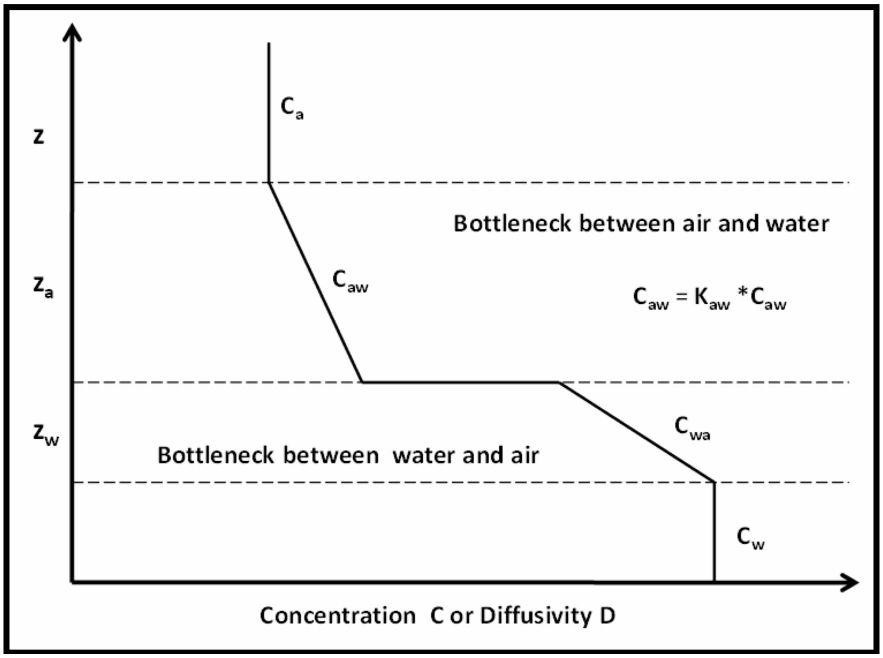

Figure B-1: Diagrammatic Sketch of a Two Bottleneck System

As presented by Schwarzenbach and noted by Baker:

Step 1 - Radon transfers from the water body to the stagnant water zone (bottleneck between water and air). This transfer occurs via the turbulent nature of the water and is dependent on water movement.

Step 2 - Radon transfers from the stagnant water zone to the stagnant air zone. This is a diffusion process. The diffusion gradient, and therefore the diffusion rate, are dependent on the depth of each zone (z_w and z_a) and the radon concentration.

Step 3 - Transfer of radon from the stagnant air zone to the air. Similar to Step 1 radon transfer due to the turbulent nature of the air and wind dispersion of radon into the air.

From Henry's law, the equilibrium partition coefficient can be defined as:

$$K_{aw} = \frac{C_a}{C_w} \qquad \text{(B-1)}$$

Where:				
	K_{aw}	=	Air-water partition coefficient	(dimensionless)
	C_a	=	Concentration of radon in the air	(pCi/L air)
	C_w	=	Concentration of radon in the water	(pCi/L water)

At equilibrium, the water concentration (C_w) is "imprinted" by the atmospheric concentration (or partial pressure) of radon.

Note from Figure B-1 that at the interface separating the two phases, the concentration jumps from C_{wa} on the water side to C_{aw} on the air side, so using Henry's law:

$$K_{aw} = \frac{C_{aw}}{C_{wa}} \quad \text{(B-2)}$$

Where:				
	K_{aw}	=	Air-water partition coefficient	(dimensionless)
	C_{aw}	=	Air/water bottleneck radon concentration	(pCi/L)
	C_{wa}	=	Water/air bottleneck radon concentration	(pCi/L)

The unknown quantity is the "contact" concentration C_{aw}. This can be solved from the flux equations as the flux must be continuous across the boundary. The general term for the flux J is:

$$J = D\frac{\delta(C)}{\delta(z)} \quad \text{(B-3)}$$

Where:				
	J	=	Radon flux	(pCi/cm^2-sec)
	D	=	Diffusion coefficient	(cm^2/sec)
	$\delta(C)$	=	Change in radon concentration	(pCi)
	$\delta(z)$	=	Distance	(cm)

The above is sufficient to determine the contact concentration C_{wa}. The flux across the interface is continuous, that is, equal on either side of the interface ($J_{aw}=J_{wa}$). Substituting in Equation B-3 and setting the fluxes equal gives:

$$\frac{D_w}{Z_w}\left(C_{wa} - C_w\right) = \frac{D_a}{Z_a}\left(C_{aw} - C_a\right) \quad \text{(B-4)}$$

Solving for the water/air bottleneck concentration (C_{wa}) gives:

$$C_{wa} = \frac{V_a C_a + V_w C_w}{V_w + V_a K_{aw}} \quad \text{(B-5)}$$

Where: $V_w = \frac{D_w}{Z_w}$ and $V_a = \frac{D_a}{Z_a}$

From Equation A-4, substituting for C_{wa}, the flux (Equation B-3) becomes:

$$J = V_w \left[\frac{V_a C_a + V_w C_w}{V_w + V_a K_{aw}} - C_w \right] \quad \text{(B-6)}$$

If the inverse of the total transfer velocity (V_{tot}) is defined as:

$$\frac{1}{V_{tot}} = \frac{1}{V_w} + \frac{1}{V_a K_{aw}} \quad \text{(B-7)}$$

then by rearranging the terms of Equation B-7, the total transfer velocity (V_{tot}) is given by:

$$V_{tot} = \frac{V_w V_a K_{aw}}{V_w + V_a K_{aw}} \quad \text{(B-8)}$$

Finally, rearranging the terms of Equation B-6 gives:

$$\begin{aligned} J &= \left[\frac{V_w V_a K_{aw}}{V_w + V_a K_{aw}} \right] \left(\frac{C_a}{K_{aw}} - C_w \right) \\ &= V_{tot} \left(\frac{C_a}{K_{aw}} - C_w \right) \end{aligned} \quad \text{(B-9)}$$

Henry's law constant gives the distribution, or partitioning, of a compound between air and water. From NIST (2008), Henry's law constant for radon is:

$$\begin{aligned} K_H^{\circ} &= 9.3 \times 10^{-3} \text{ (mol/kg-bar) / 0.987 (atm/bar)} \\ &= 9.42 \times 10^{-3} \text{ (mol/kg-atm)} \end{aligned} \quad \text{(B-10)}$$

$$\begin{aligned} K_H^{CP} &= 9.42 \times 10^{-3} \text{ (mol/kg-atm)} \times 997 \text{ (kg/m}^3\text{)} \\ &= 9.39 \times 10^{-3} \text{ (mol/L-atm)} \end{aligned} \quad \text{(B-11)}$$

The air-water partition coefficient is defined as the inverse of Henry's law constant:

$$K'_{aw} = \frac{1}{K_H^{CP}} = 106.4 \text{ (L–atm/mol)} \quad \text{(B-12)}$$

A dimensionless form of Henry's law constant can be computed by using the ideal gas law and multiplying K_H^{CP} by the universal gas constant times temperature. Thus, to obtain a dimensionless air-water partition coefficient (K_{aw}), K'_{aw} is divided by the universal gas constant times temperature:

$$K_{aw} = \frac{K'_{aw}}{R\,T} = 4.35 \qquad \text{(B-13)}$$

Where:	K_{aw}	=	Air-water partition coefficient	(dimensionless)
	K'_{aw}	=	Air-water partition coefficient	(L-atm/mol)
	R	=	Universal gas constant	(L-atm)/(K^{o}-mol)
		=	0.0821	(L-atm)/(K^{o}-mol)
	T	=	Temperature	(K^{o})
		=	298.15	(K^{o})

The diffusion coefficients for molecular diffusion of radon are about 10^{-5} cm^2/sec in water and 0.11 cm^2/sec in air. The assumed film thicknesses are 100 microns for water and 1000 microns for air (0.01 cm and 0.1 cm). Substituting into Equation B-5 gives 10^{-3} cm/sec and 1.1 cm/sec for the transfer velocities for water (V_w) and air (V_a), respectively, and into Equation B-8 gives ~10^{-3} cm/sec for the total transfer velocity (V_{tot}). Thus, for a 1 pCi/L unit concentration of radon in the water, the flux (J) can be approximated as:

$$J = 10^{-3}\ \text{(cm/sec)}\ 1\ \text{(pCi/L)}\ 10^{-3}\ \text{(L/cm}^3\text{)}\ 100^2\ \text{(cm}^2\text{/m}^2\text{)}$$
$$= 0.01\ \text{(pCi/m}^2\text{-sec) per (pCi/L of dissolved radon)}$$

EPA-3186

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Subpart W Docket.msg

- RE Subpart W Docket.msg

From: Rosnick, Reid
Sent: Thursday, September 12, 2013 11:32 AM
To: Miller, Beth
Subject: FW: Deliverable

Beth,

Could you please put this in the Subpart W docket? Thanks

Reid

From: Abe Zeitoun [mailto:azeitoun@scainc.com]
Sent: Thursday, September 12, 2013 10:28 AM
To: Rosnick, Reid
Cc: Daigler, Valerie
Subject: RE: Deliverable

Good morning Reid,

Here is the document

Abe Zeitoun
SC&A S. Cohen & Associates An Employee-Owned Company

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Wednesday, September 11, 2013 4:17 PM
To: azeitoun@scainc.com
Cc: Daigler, Valerie
Subject: Deliverable

Hi Abe,

I have been looking for a deliverable that SC&A produce a couple of years ago but I have not been able to find. It is:

SC&A 2010. "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions form Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds," Contract # EP-D-10-042, WA No. 1-04, Task 5, Nov 2010

Would you happen to have a copy you could send to me? Thank you.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Precise Reference:

Nielson, K K and Rogers, V C, 1986, *Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium Tailings ponds*. Proc. "8th Annual Symposium on Geotechnical & Geohydrological Aspects of Waste Management", Geotechnical Engineering Program – Colorado State University & A A Balkema, Fort Collins, Colorado, USA, February 5-7, 1986, pages 215-222.

Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds

KIRK K.NIELSON & VERN C.ROGERS
Rogers & Associates Engineering Corp., Salt Lake City, Utah, USA

1 INTRODUCTION

In assessing the releases of radon (Rn-222) from uranium mill sites, the radon escaping from water-covered surfaces of the tailings pond has traditionally been ignored (NRC 1980a, NRC 1980b, NRC 1981). This has been justified by radon diffusion calculations, which suggest that radon cannot penetrate more than a few centimeters of water because of its very low diffusion coefficient (10^{-5} cm^2s^{-1}). The tailings pond is not a motionless body of water, however, and considerable water movement occurs over time periods comparable with the half-life of radon (3.8 days). Therefore, significant advective transport of radon may occur, rendering the pond less effective than previously thought for containing radon gas.

In a recent study for EPA on radon releases from active uranium mills, we examined the potential for advective transport of radon through tailings pond waters along with other radon sources in the mill environment (Rogers et al., 1985). This paper summarizes the parts of the study that dealt with radon releases from the tailings pond area, and discusses the nature and mechanisms of the radon releases from water-covered areas. A reference tailings impoundment is described according to several distinct physical regions, and the conditions affecting radon transport in each are described. Since radon transport through ponded water has not previously been modeled in detail, simple laboratory experiments were conducted to approximate the characteristic transport parameters. The results of these experiments were then used with parameters describing the tailings pond to assess the overall magnitude of radon release expected from the water-covered pond region. The significance of radon releases from the water-covered areas was estimated by comparison to radon fluxes from other, exposed tailings surfaces.

2 REFERENCE TAILINGS IMPOUNDMENT

A reference tailings impoundment that approximates actual impoundments is first defined to illustrate three characteristic regions with distinctly different physical properties that affect radon transport. The reference impoundment also provides a basis to estimate the magnitude of radon releases from tailings ponds. The impoundment contains a central, water-covered pond area, surrounded by a water-saturated beach area, and an unsaturated beach area. Tailings enter the impoundment via a slurry pipeline from the mill, and are depleted in emanated radon for the first few days due to complete radon releases during milling. The total mass of new depleted tailings entering the impoundment is insignificant compared to the total mass in the impoundment, however, so the total radon release rate is relatively constant. Since the slurry pipeline delivers both coarse (sandy) and fine (slime) tailings, the sands tend to accumulate near the pipeline, while the slimes are carried further into the center of the pond. The slurry pipe is typically moved to different positions around the edge of the impoundment, so that the sandy tailings typically comprise most of the saturated and unsaturated beach areas, and the slimes accumulate in the center pond area. The radon source materials and diffusion characteristics in the pond, saturated, and unsaturated areas are thus different, and are described in terms of nominal parameter values to permit estimates of their relative impacts on radon releases.

The unsaturated beach areas are considered to be comprised exclusively of tailings sands, and to be sufficiently above the water level that they are well-drained and similar to surrounding sandy soils in moisture content. Radon originating in these regions is defined in terms of the radium content for the sands, which is typically much lower than that for the slimes. Once radon gas is emanated into the interstitial pore space of the sands, it diffuses according to the characteristics already known and modeled for unsaturated soils and tailings (Rogers et al., 1984a), and is dominated by diffusive transport mechanisms. Advective transport by air or vapor currents in unsaturated regions such as the tailings beaches has been examined and is considered insignificant (Rogers et al., 1983). Accordingly, radon fluxes are computed for the unsaturated beaches as

$$J = 10^4 R\rho E\sqrt{\lambda D} \qquad (1)$$

where

- J = radon flux from the exposed tailings surface ($pCi\ m^{-2}s^{-1}$)
- R = tailings radium content ($pCi\ g^{-1}$)
- ρ = bulk tailings density ($g\ cm^{-3}$)
- E = radon emanation coefficient for tailings (dimensionless)
- λ = radon decay constant ($2.1 \times 10^{-6}\ s^{-1}$)
- D = diffusion coefficient for radon in the tailings pore space ($cm^2\ s^{-1}$)

The saturated beach areas are considered to be comprised of approximately 70 percent sands and 30 percent slimes, reflecting the limited mixing of slimes in this part of the tailings mass. Although this area of the impoundment is variable and more difficult to define in terms of physical extent, its diffusion characteristics are more distinct in being saturated by water. Despite wave action over the saturated beach areas, advective transport in the interstitial volume is probably limited to only the top few centimeters, as defined by the wave-pond elevation difference. The radon source term for the saturated beaches is modeled as a weighted average of the respective radium contents of the sands and slimes (70/30 ratio) multiplied by their respective emanation coefficients. Transport of emanated radon to the atmosphere, neglecting liquid advection in the top wave-affected layer, is dominated by diffusion through the saturated

interstitial space, with a typical diffusion coefficient on the order of $10^{-5}\ cm^{-2}s^{-1}$ (Rogers et al., 1984a).

The tailings beneath the pond area are assumed to be comprised of approximately 50 percent sands and 50 percent slimes. In this region the radon source term is similarly computed as a weighted average of the respective radium contents of the sands and slimes (50/50 ratio) multiplied by their respective emanation coefficients. Movement of emanated radon to the atmosphere includes advective as well as diffusive transport, since considerable water movement occurs within the pond over time periods comparable to the half-life of radon. The movement is partly caused by surface wind currents, thermal gradients, mechanical disturbance from the mill discharge pipe, and biological disturbances (animals, birds, etc.). In addition, radon release from the radium dissolved in the water must now be considered separately, since the water is physically separated by significant distances from the solid tailings material. For analyzing the pond area, radon releases were divided into three components:

1. Radon originating from solid tailings under less than 1 m of water.
2. Radon originating from solid tailings under greater than 1 m of water.
3. Radon from the dissolved radium in the pond water.

The one meter depth is chosen to partition the surface water, where turbulant movement is pronounced and often visible, from deeper layers, where advection is minimal. Although actual advective currents probably decrease continuously with depth, this partitioning conveniently defines a "rapid release" zone for radon and a deeper decay-limited transport zone.

3 LABORATORY MEASUREMENTS AND RESULTS

In order to quantify radon releases from the above pond sources, several parameters were measured in the laboratory, using a sample of slime tailings from the Rifle, Colorado UMTRAP site. The measured parameters included the solubility of the tailings radium and the transport coefficient for radon through "undisturbed" columns of water in the laboratory. In order to interpret the radon transport experiments, radium contents, emanation coefficients, and related tailings parameters were also measured. The key tailings parameters are summarized in Table I.

TABLE I

Characteristics of Tailings used as Radon Sources

R =	4628 pCi/g Ra-226
E =	0.25 pCi Rn-222 released per pCi Ra-226
Porosity =	0.66 in test columns
Solubility =	35 pCi/liter Ra-226 in separated column water.

The slime tailings sample was oven dried, and 200-gram aliquots were weighed into each of four Boyoucos soil test cylinders. Seven hundred ml of water were added to each cylinder, after which they were stirred and allowed to settle and equilibrate for at least 22 days. The

settled tailings occupied the bottom 8.9 cm of the 5.9 cm diameter glass cylinders, and the water layer comprised an average height of 19.4 cm above the tailings. Radon flux measurements were then made from the water surfaces after first circulating fresh air over the undisturbed water. After the radon flux measurements, the water was carefully siphoned from the columns without disturbing the tailings layers. Additional radon flux measurements were then made from the bare, saturated tailings. The radon flux measurements utilized both the accumulator can and charcoal canister techniques (Rogers et al., 1984b). The accumulator can measurements gave a ten-minute average flux, and the charcoal canister measurements gave a 24-hour average flux. The results were averaged and reported in terms of a mean and standard deviation.

The results of the laboratory measurements are presented in Table II. The relatively high radon fluxes penetrating 19.4 cm of water indicated clearly that molecular diffusion did not account for the observed radon transport through the columns. Despite precautions to avoid agitation and vibrations, advective transport (probably thermally induced) dominated the observed radon flux, which would have been nearly four orders of magnitude lower with only diffusive transport in undisturbed water. The removal of the water (not disturbing the tailings) allowed measurement of the bare radon flux from the saturated tailings, and gave evidence that the advective forces acting in the water cover were not active in the saturated tailings region. Instead, the low diffusion coefficients typical of water-saturated pore space were found to be typical.

TABLE II

RADON FLUXES MEASURED FROM BARE AND WATER COVERED TAILINGS SURFACES (mean ± S.D.)

Undisturbed water, Accumulator Can	75 ± 19
Undisturbed water, Charcoal Canister	68 ± 7
Bare, saturated tailings, Accumulator Can	84 ± 21

The results of the laboratory flux measurements were compared with values obtained using the RAECOM computer code (Rogers et al., 1984a). Using the radium content, emanation coefficient, and porosity from Table I, the RAECOM code gave a computed radon flux of 83 pCi $m^{-2}s^{-1}$ using its default (correlation) value for the diffusion coefficient in the saturated tailings. This compares well with the mean measured flux value of 84 pCi $m^{-2}s^{-1}$ and also supports the selection of $4 \times 10^{-5}\ cm^2s^{-1}$ for the radon diffusion coefficient in the submerged tailings. Further RAECOM analyses of the 17 percent attenuation provided by the undisturbed water indicated that the effective transport coefficient for the water layer was on the order of 0.003 cm^2s^{-1}. The dissolved radium content measured from the water layers and shown in Table I, gives negligible contribution to the measured fluxes, but gives a nominal solubility parameter for evaluating the reference tailings impoundment.

4 APPLICATIONS AND DISCUSSION

In applying the Laboratory data to estimate radon releases from submerged tailings, the high uncertainties and lack of lab/field experiment correspondence preclude quantitative accuracy from being associated with the conclusions. However, the lab data conclusively show that non-diffusive transport can dominate radon movement, even in visually "undisturbed" water columns. Since surface turbulence is invariably visible in tailings ponds, we infer that greater advective transport occurs in the pond surface layers. In the absence of turbulence data for either the deep or shallow pond water, we qualitatively associate the measured laboratory transport coeffecient with possible transport characteristics of the deep ($\gg$1m) impoundment water.

For the shallow ($\ll$1m) impoundment water, extrapolations of visual dye movement tests indicate advective velocities may exceed 1-2 mm/minute, resulting in virtually no radon containment by the surface water. If shallow water movement is sufficient to remove radon from the tailings-water interface and transport it to the atmosphere in a short time (several hours), the radon flux from the shallow tailings is nearly as great as that from similar bare saturated tailings, hence no significant radon attenuation is considered.

For tailings at depths greater than one meter, the radon transport properties of the pond water are considered to follow the Laboratory value of 0.003 cm^2s^{-1} up to the 1-meter depth, above which no further attenuation occurs. For dissolved radium, the same water motion that facilitates rapid radon release from the shallow water also allows release of all radon generated in the top meter of the pond. Thus, the applicable flux equation for radon from the top meter of water over the deep fraction of the pond and for the average half-meter of water over the shallow fraction is

$$J_d = 10^6 K_s R\lambda\,(1 - 0.5\,f_s) \qquad (2)$$

where

- K_s = ratio of radium in solution to radium in tailings solids ($g\ cm^{-3}$).
- f_s = fraction of pond area with less than 1 meter depth.

Radon generated from dissolved radium below one meter is transported according to the 0.003 cm^2s^{-1} coefficient up to the one meter depth, where it is rapidly released to the atmosphere. The three radon sources, shallow tailings, deep tailings, and dissolved radium, are added to obtain a simplified estimate for the average flux from the tailings pond,

$$J = 10^4 R\rho E\sqrt{\lambda D}\,[f_s + (1-f_s)A] + 10^6 K_s R\lambda(1 - 0.5 f_s) \qquad (3)$$

where

- A = attenuation factor for deep water.

The attenuation factor, A_t, is determined from RAECOM calculations, or it can also be approximated by

$$A_t = \exp\left[-\sqrt{\lambda/D_{tr}}\,(x_p - 100)\right] \qquad (4)$$

where

D_{tr} = effective stagnant water transport coefficient (cm^2s^{-1})
X_p = average pond depth for areas greater than 1 meter deep (cm)

In order to estimate radon releases from a tailings impoundment, numerous site-specific parameters must be defined. Some, such as ore grade, area of the impoundment surfaces, etc. are readily known or measurable, while others, such as diffusion coefficients, are usually unknown without specific measurements. Table III presents nominal values for some of the required parameters for the present estimates. Other values, such as emanation coefficients, moistures and diffusion coefficients for the unsaturated tailings, were based on site-specific data (Rogers et al., 1985).

TABLE III

Tailings Parameters used in Radon Transport Calculations

	Submerged Tailings	Saturated Tailings	Unsaturated Tailings
Sand/slime ratio	50/50	70/30	100/0
Bulk density (g cm^{-3})	1.55	1.57	1.60
Porosity	.40-.42	.39-.41	.38-.40
Moisture Saturation	1.0	1.0	.33-.57
Surface Area (m^2)	4.0E5	2.0E5	9.0E4

For calculating radon emissions from the unsaturated, sandy tailings at the outer edges of the impoundment, equation 1 was used to obtain the normalized radon fluxes in Table IV. The radon release is normalized to account for the typical 4:1 ratio of radium activity in the slimes compared to that in the sands, and also to account for their bulk density difference as defined in Table I. The resulting data in Table IV are thus normalized to the average radium in the original ore not just for the sands alone. It should also be emphasized that the use of specific fluxes presupposes a fixed diffusion coefficient in the source material, and thus does not have general application to areas in which moistures or diffusion coefficients are greatly different.

TABLE IV
Specific Radon Fluxes Computed for Six State Milling Regions for Three Parts of a Uranium Tailings Impoundment
(pCi $m^{-2}s^{-1}$/pCi g^{-1})

	State						
Tailings	CO	NM	TX	UT	WA	WY	Mean
Unsaturated	0.42	0.76	0.23	0.29	0.29	0.43	0.40
Saturated Beach	0.036	0.062	0.031	0.027	0.031	0.035	0.037
Pond	0.020	0.033	0.019	0.017	0.019	0.021	0.022

For the mixed tailings in the saturated beach areas, Table IV gives the corresponding specific fluxes assuming a 70/30 mass ratio of sands/slimes, and assumes a combined mean density of 1.57 gcm^{-3}. The resulting average specific fluxes are again normalized to the average radium content of the original ore.

For the ponded areas of the tailings, is was assumed that one-fourth of the pond area was less than one meter deep, and that the tailings are 50/50 sands/slimes. The value of K_s (NRC 1980) is 8.92E-4 g/ml. The diffusion coefficient for tailings measured in the laboratory was similar to the predicted value from earlier correlations, and so the correlation value of 4.0E-5 cm^2s^{-1} was used. A lower-bound estimate of the diffusion coefficient for deep water was obtained from the laboratory measurement, D_{tr} = 0.003 cm^2s^{-1}. This value was used in RAECOM calculations (Rogers et al., 1984a) to obtain an average attention factor of A_t = 0.17, which was used in the analysis. The resulting normalized radon fluxes from the water-covered tailings using equation (3), and dividing by R, are shown by state in Table IV.

In order to assess the relative importance of total radon releases for the three tailings regions, a reference uranium mill is defined to process one with an average grade of 0.1 percent U_3O_8. Its tailings impoundment is also defined to have the surface areas shown in Table III. The resulting total radon releases, expressed in Ci/day for each tailings region in the six states are summarized in Table V. The total radon releases vary from 0.9 to 2.3 Ci/day, and are dominated (69%) by the unsaturated sandy tailings, as might be expected. Although the submerged tailings account for only 17% of the total, they are much more important than previously estimated. Although to be regarded qualitatively, this study suggests that rado mitigation by submerging tailings in the pond water may be much less effective than has been previously assumed. From the specific fluxes in Table IV, it is seen that saturating or submerging the tailings is still effective in significantly reducing radon fluxes by an order of magnitude, but that the advantage of additional water over the saturated tailings is proportionately reduced.

TABLE V

Summary of Total Radon Emissions from the Reference Tailings Impoundment in Six States
(Ci/day)

	State						
Tailings	CO	NM	TX	UT	WA	WY	Mean
Unsaturated	0.92	1.66	0.50	0.63	0.63	0.94	0.88
Saturated Beach	0.18	0.30	0.15	0.13	0.15	0.17	0.18
Pond	0.19	0.32	0.19	0.17	0.19	0.20	0.21
Total	1.29	2.28	0.84	0.93	0.97	1.31	1.27

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Importance: High

Hi Beth,

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Also, attached is a new addition to the docket. Thanks!

Reid

____
Reid J. Rosnick
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Radon releases from Australian uranium mining and milling projects: assessing the UNSCEAR approach

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Abstract

The release of radon gas and progeny from the mining and milling of uranium-bearing ores has long been recognised as a potential radiological health hazard. The standards for exposure to radon and progeny have decreased over time as the understanding of their health risk has improved. In recent years there has been debate on the long-term releases (10,000 years) of radon from uranium mining and milling sites, focusing on abandoned, operational and rehabilitated sites. The primary purpose has been estimates of the radiation exposure of both local and global populations. Although there has been an increasing number of radon release studies over recent years in the USA, Australia, Canada and elsewhere, a systematic evaluation of this work has yet to be published in the international literature. This paper presents a detailed compilation and analysis of Australian studies. In order to quantify radon sources, a review of data on uranium mining and milling wastes in Australia, as they influence radon releases, is presented. An extensive compilation of the available radon release data is then assembled for the various projects, including a comparison to predictions of radon behaviour where available. An analysis of cumulative radon releases is then developed and compared to the UNSCEAR approach. The implications for the various assessments of long-term releases of radon are discussed, including aspects such as the need for ongoing monitoring of rehabilitation at uranium mining and milling sites and life-cycle accounting.

Keywords: Uranium mining; Radon; Australia; UNSCEAR

1. Introduction

The exhalation and release of radon gas into the environment are the products of the radioactive decay chain of primordial uranium or thorium, specifically the isotopes ^{238}U, ^{235}U and ^{232}Th. The radon isotopes formed from these decay chains are ^{222}Rn ('radon'), ^{219}Rn ('actinon') and ^{220}Rn ('thoron'), which are the direct decay products of the radium isotopes ^{226}Ra, ^{223}Ra and ^{224}Ra, respectively, in these chains. Due to the low abundance of ^{235}U in natural uranium and the short half-life of actinon (4 s), most work concentrates on ^{222}Rn and its decay progeny since this is the dominant source of exposure. In general, most uranium deposits contain low primary thorium (^{232}Th) and hence thoron (^{220}Rn) is generally considered to be of minor radiological importance. All reference to radon and radium hereafter refers to ^{222}Rn and ^{226}Ra, respectively.

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Radon is a chemically inert noble gas with a half-life of about 3.8 days, while its decay products or progeny of various isotopes of bismuth (Bi), polonium (Po) and lead (Pb) generally forms solids at normal environmental conditions (Cothern and Smith, 1987). The half-lives of radon progeny vary from microseconds to minutes to years. The rates of radon release are complex and depend on many factors, such as rock mineralogy and structure, the distribution of parent radionuclides (e.g. ^{238}U, and ^{226}Ra), temperature and moisture content (Barretto, 1973; Cothern and Smith, 1987; Hart, 1986; Lawrence, 2006). The fraction of radon which is released relative to its total production is known as the emanation coefficient, and can range from 0 to 1 but is generally between 0.2 and 0.5 (Flügge and Zimens, 1939).

Due to the natural abundance of about 2.7 mg/kg uranium in soils and rocks (Langmuir, 1997; Titayeva, 1994), there is a global average radon exhalation from soils of about 0.015–0.023 Bq/m^2/s (UNSCEAR, 1982). The seasonally-adjusted arithmetic mean radon and thoron exhalation from Australian soils are about 0.022 ± 0.005 and 1.7 ± 0.4 Bq/m^2/s, respectively (Schery et al., 1989). The average ^{226}Ra and ^{224}Ra soil activities are 28 and 35 mBq/g, respectively (Schery et al., 1989).

Within the vicinity of a uranium deposit or project, the release rates of radon and activities in air can be elevated over natural background, depending on local conditions and/or project operations. The inhalation or ingestion of significant activities of radon and progeny has long been considered to be related to elevated incidences of lung cancer and other diseases in uranium industry workers (Dalton, 1991; Fry, 1975; NAS, 1980; NAS, 1988; Teleky, 1937).

In recent years there have been some attempts to quantify the long-term (~10,000 years) public radiological exposure from the release of radon due to uranium mining and milling operations as part of life-cycle analyses of the nuclear fuel chain. The principal work has been undertaken by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) in their periodic reports to the United Nations General Assembly. The main analysis of radon releases and the associated public radiological exposure over 10,000 years are given in UNSCEAR (1993), with a minor update by UNSCEAR (2000). The UNSCEAR analyses combine other stages of the nuclear fuel chain and present normalised radiological exposures per annual unit of energy generated, summarised in Table 1. The different estimates from the 1993 and 2000 reports are based on criticisms, feedback and the adoption of scenarios perceived to be more realistic for modern uranium mines. Both UNSCEAR estimates suggest that uranium mining and milling, based on the assumption of radon releases from tailings only, are the major factors in long-term public radiation exposure from the nuclear fuel chain, generally comprising between 16% and 75% of the local and global exposures from the nuclear fuel chain. The UNSCEAR (1993) estimate for global exposure

Table 1
Long-term radiological exposure of the nuclear fuel chain (UNSCEAR analyses)

Stage of the nuclear fuel chain	Collective effective dose committed per unit energy generated (person Sv/GWe year)					
UNSCEAR report	1993	2000	2000	2000	2000	2000
Period		1970–1979	1980–1984	1985–1989	1990–1994	1995–1997
Local and regional component						
Mining, milling and tailings	1.5	0.238	0.238	0.238	0.238	0.238
Fuel fabrication	0.003	0.003	0.003	0.003	0.003	0.003
Nuclear reactor operation	1.3	3.2	0.9	0.46	0.45	0.44
Reprocessing	0.25	8.5	1.9	0.17	0.13	0.12
Transportation	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	3.15	11.94	3.04	0.87	0.82	0.81
Global component (including solid waste disposal)						
Tailings (over 10,000 years)	150	7.5	7.5	7.5	7.5	7.5
Reactors						
Low-level waste	5×10^{-5}	5×10^{-5}	5×10^{-5}	5×10^{-5}	5×10^{-5}	5×10^{-5}
Intermediate waste	0.5	0.5	0.5	0.5	0.5	0.5
Reprocessing solid waste disposal	0.05	0.05	0.05	0.05	0.05	0.05
Globally dispersed radionuclides	50	95	70	50	40	40
Total	200.5	103	78	58	48	48

References: UNSCEAR (1993, Table 53, p. 200) and UNSCEAR (2000, Table 45, p. 284).

from tailings-derived radon was 150 person Sv/GWe year (ranging from 1 to 1000), with the UNSCEAR (2000) estimate being 7.5 person Sv/GWe year.

The radon data and assumptions used by UNSCEAR in their analyses have been questioned by Chambers et al. (1998a,b) and Frost (2000). In general, these authors argue that the UNSCEAR analyses adopt the most pessimistic values and that more realistic radon release scenarios suggest that the exposures are considerably lower. For example, Chambers et al. (1998a,b) argue that the long-term radiological exposure due to radon is 0.96 person Sv/GWe year, considerably lower than the UNSCEAR estimates.

The various analyses noted above, however, are still based on a limited survey of studies and the literature and do not take into proper account the numerous investigations which provide actual field measurements of radon releases from rehabilitated, operating and abandoned uranium projects. The UNSCEAR data used for Australia in particular are reliant on written advice from specific operations and appear to use only a minimal degree of field-measured data.

It is the normal standard of radiation dose management to follow the 'as low as reasonably achievable' or ALARA principle. That is, radiation exposure and doses should be kept to the minimum practicable. In the context of life-cycle analyses of the nuclear fuel chain, and uranium mining specifically, this therefore means the minimisation of public doses during operation and to ensure any changes from baseline radiological conditions following rehabilitation are also minimal, or even potentially beneficial (i.e. a reduction).

For this paper, radon exhalation shall refer to the radon per unit area per time (Bq/m^2/s) that enters the environment while radon releases shall be used to specify the mass per time (GBq/d) at which radon enters the environment.

The sources of radon from a typical uranium project are now reviewed followed by a detailed review of radon releases from the various Australian projects compared to pre-mining, where known. The comprehensive data set is then analysed to provide a more systematic basis for the figures used to assess the long-term radiological exposure due to radon as per the UNSCEAR approach. The implications for current uranium projects in Australia are then discussed.

2. Radon source terms

The principal sources of radon at a uranium mining and milling project are uranium ore (including low-grade ore), waste rock, open cuts or underground mines, processing mill, water management ponds and tailings. Sites where contamination has occurred, primarily due to radium, can also be a source of radon. For an *in situ* leach mining site, the dominant radon sources are the processing mill, groundwater bores, solution pipelines and water management ponds. Assuming a project site is effectively rehabilitated, the only change to radon releases is the removal of the mill as a major source and the long-term success of rehabilitation works on tailings, remaining ore, waste rock and contaminated areas. Any analysis of radon releases should therefore assess all of these sources and not just focus on tailings.

The main properties required to quantify radon releases include specific radium activity, material porosity and density, moisture content, and the variation of the emanation coefficient and the radon diffusion coefficient with moisture content. Based on experiments, the radon diffusion coefficient can be calculated from theoretical considerations providing that other variables are known, such as moisture content and porosity (Hart, 1986; Rogers and Nielson, 1981; Strong and Levins, 1982). An alternative approach and model are developed by Rogers and Nielson (1981) using moisture content and pore size distribution to predict radon diffusion rates and overall exhalation.

The United States Nuclear Regulatory Commission estimated the radon source terms for a 'model mill' in the Final Generic Environmental Impact Statement on Uranium Milling (USNRC, 1980). The 'model mill' processed 0.56 Mt ore per year grading 0.10% U_3O_8 to produce 520 t U_3O_8, it had an ore pad area of 0.5 ha, with a tailings dam area of 50 ha and a dry density of 1.6 t/m^3 (Table 5-1, pp. 4–5). The analyses suggested that ore stockpiles and crushing facilities would release 6.9 GBq/d of radon, while tailings would release about 446 GBq/d, including a small allowance for dispersed ore and tailings of 4.9 GBq/d (Table 5-5, pp. 5–8).

In Australia, the Ranger Uranium Environmental Inquiry (1975–1977) considered that the main source of radon releases from the Ranger project would be 20–148 GBq/d from the processing mill, about 96 GBq/d from ore stockpiles, between 20 and 281 GBq/d from the open pits and 1.4–14 GBq/d from saturated or water-covered tailings (Fox et al., 1977). The most controversial aspect of radon releases was tailings. Radon data presented to the Inquiry and more recent estimates have ranged from '0' to 4440 GBq/d (Mudd, 2002). There are no published systematic measurements from the Ranger project of all radon sources in one study to verify the Ranger Inquiry predictions.

The exhalation and release of radon from different uranium deposits will vary considerably, depending on local geologic structure and environmental conditions. An important principle in the assessment of radon impacts due to uranium mining and milling is the change from existing baseline conditions governed by the above, especially given the altered nature of the properties of mined materials compared to *in situ* geology. It is only in more recent decades, however, that pre-mining studies have been undertaken in Australia, although not necessarily as comprehensively as needed for long-term impact assessment.

3. Uranium mining and milling wastes in Australia

3.1. Overview

The mining, milling and export of uranium have been undertaken on a large scale in Australia since 1954 and have gradually expanded to a current annual production of about 11,000 t of uranium oxide (U_3O_8). Small but determined attempts to develop a radium mining industry between 1906 and 1934 failed to lead to commercial uranium production (Mudd, 2005). Most modern uranium mines have been open cut, although some have been underground plus some *in situ* leach or 'solution' mining sites. The currently operating commercial mines are Ranger (open cut), Olympic Dam (underground) and Beverley (acid *in situ* leaching). To date, there has been a total of 11 uranium mills, including pilot projects, and about 31 mines of various scale supplying ore to adjacent or nearby mills or for pilot milling and exploration work. The location of uranium mining and milling sites and other uranium deposits in Australia is shown in Fig. 1, with annual production from 1954 to 2005 in Fig. 2. The quantity of uranium production, ore grades and associated mine wastes is given in Table 2. A compilation of pertinent data for uranium deposits referred to in this paper is given in Table 3.

The management of uranium mill tailings and mine wastes in Australia has changed over the years as regulation of the radiological and environmental hazards has improved and community expectations evolve. During the 1950s in the Northern Territory, tailings and liquid wastes were generally discharged onto adjacent lowland areas which formed part of creek lines and rivers. During the intense rainfall of the tropical wet season, both erosion and water quality impacts were quite significant. In contrast, the mills in arid regions of Queensland and South Australia constructed engineered dams to retain tailings and liquid wastes. From the 1970s it has been a standard regulatory and community preference to use above ground dams for interim management only and to transfer tailings back into a mined out pit as soon as practicable after the completion of mining. Although *in situ* leach mining was tested on a pilot scale in the 1980s using acid leaching at Honeymoon and alkaline leaching at Manyingee, acid leaching has only recently been developed on a commercial scale at Beverley in 2001.

The management of low-grade ore and waste rock has received less attention despite being potentially significant radon sources. In general, these materials have been placed in piles or heaps. At some sites, due to acid mine drainage, the heaps have been rehabilitated with soil covers while at other sites they have or will be covered mainly for erosion and water quality control.

There are very few measurements of radon releases from processing mills in Australia as well as from contaminated areas, water management ponds and active mines (open cut and underground).

3.2. Average tailings data

The data in Table 2 show that the production of each tonne of Australian uranium (as U_3O_8) requires about 848 t of ore and 1152 t of combined low-grade ore and waste rock. The average ore grade is about 0.146% U_3O_8 (range 0.075% to ∼2% U_3O_8) with a specific radium activity of 15.2 Bq/g (range 0.56–191 Bq/g; assuming secular equilibrium and minimal radium losses during milling and storage), while the tailings contain residual uranium of about 0.028% U_3O_8 (range 0.02% to ∼0.10% U_3O_8).

An important aspect of the UNSCEAR analyses was the average area taken up by tailings, normalised to the area per annual energy output and assumed to be 1 ha/GWe year (UNSCEAR, 1993). This is important due to the slow rates of radon diffusion in tailings. For a given mass of tailings, a thicker tailings pile will allow less radon exhalation into the environment than a thinner but greater area tailings pile. A compilation of the areas and dry densities of the different tailings' piles in Australia are given in Table 4, based on existing, proposed or as-rehabilitated scenarios. The tailings data for Rum Jungle are approximate only (due to conflicting sources).

UNSCEAR adopted a tailings dry density of 1.6 t/m^3. In practice, most tailings Australian sites have a density lower than this, such as the above ground dam at Ranger with a density of about 1.0 t/m^3 (Li et al., 2001; Sheng

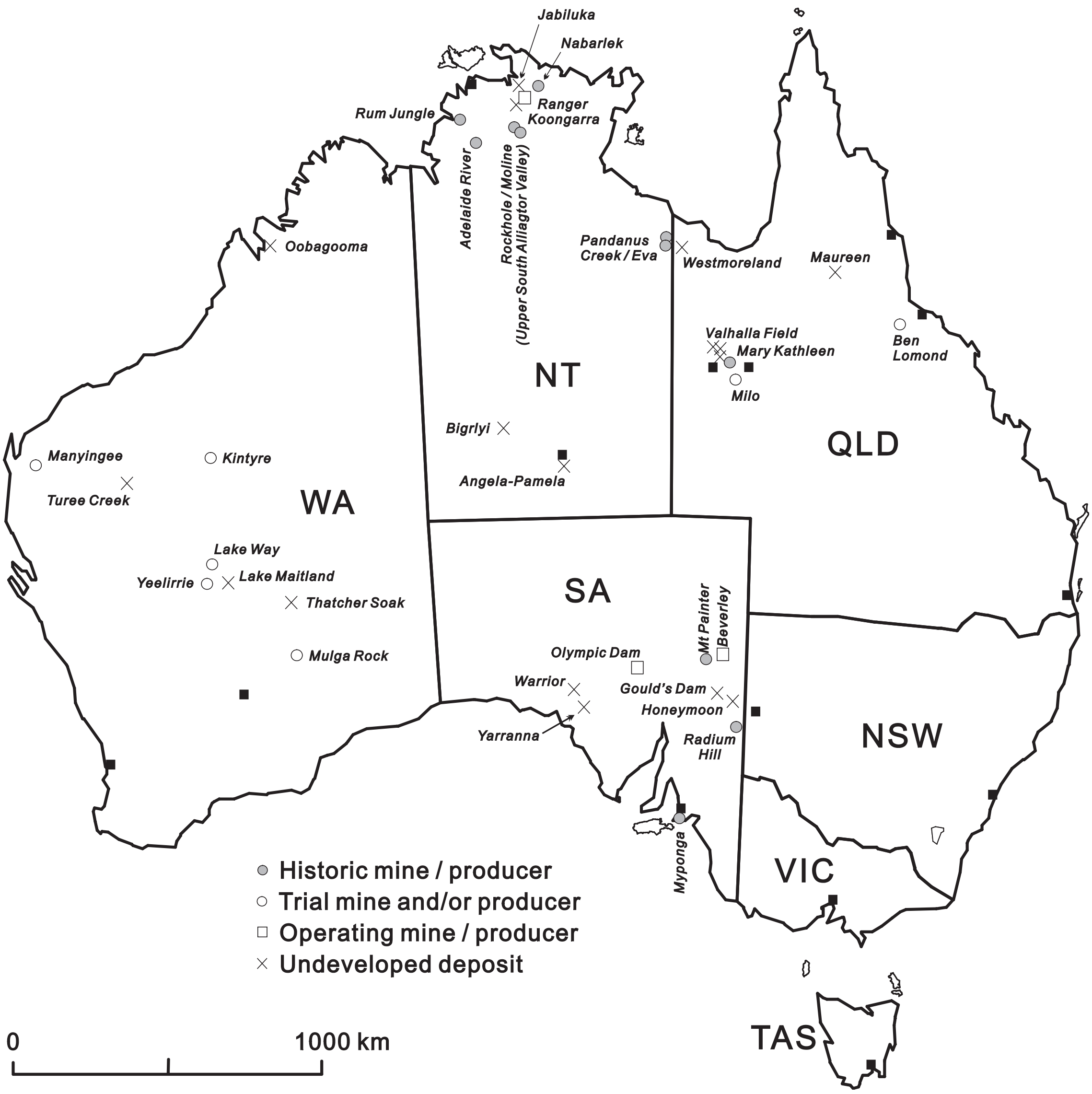

Fig. 1. Location of major uranium deposits in Australia.

et al., 1997) and Pit 1 tailings facility averaging about 1.4 t/m^3 (2005 Edition, ERA, 1984–2005). For Ranger, the tailings particle density is approximately 2.7–2.8 t/m^3 (Sheng et al., 2000; Sinclair, 2004). The Olympic Dam tailings' dams, however, apparently achieve a higher density ranging from 1.6 to 2.0 t/m^3 and averaging 1.7–1.8 t/m^3 with tailings particle density ranging from 3.2 to 3.6 t/m^3 (Johnston, 1990; Ring et al., 1998; Waggitt, 1994). The initial tailings density at Nabarlek in the early 1980s was not more than 1.0 t/m^3 (OSS, 1983) but by the time of complete site rehabilitation in 1994, a density of about 1.3 t/m^3 can be estimated based on pit volume, milling rates, and final depths of tailings, waste rock and covers. There is a general lack of tailings density data at older sites, with some of the values in Table 4 either deduced or estimated.

To date, the 123 Mt of Australian uranium mill tailings are estimated to average the UNSCEAR density of 1.6 t/m^3 at a volume of about 78 Mm^3, and an average depth of the order of 14 m.

Based on the data in Table 4, currently proposed rehabilitation strategies and using the UNSCEAR figure of 250 t U_3O_8/GWe year, a normalised tailings production value of 0.95 ha/GWe year can be estimated – virtually the same as

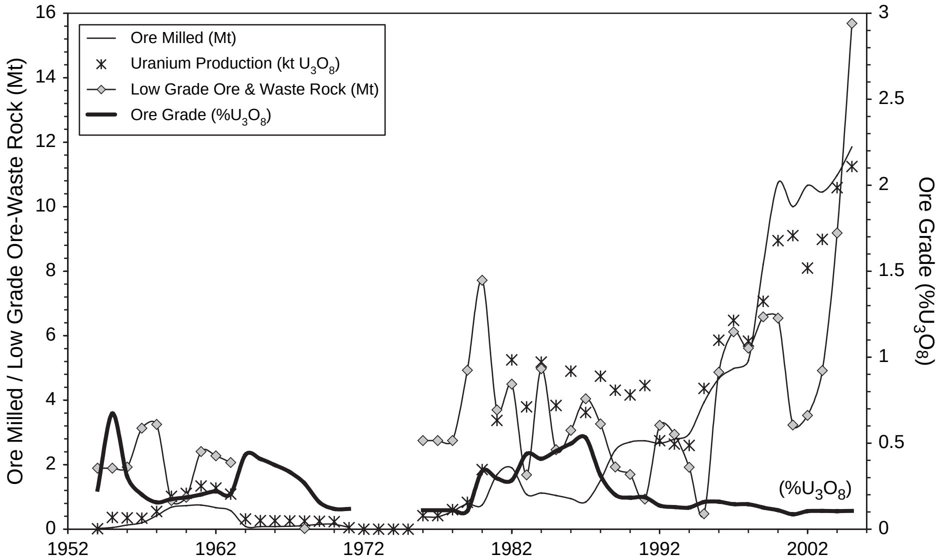

Fig. 2. Annual Australian uranium production statistics 1954−2005.

the UNSCEAR estimate of 1 ha/GWe year. Although rehabilitation works are planned for sites such as Ranger and Olympic Dam, the areal extent of the tailings repositories is difficult to predict given the potential for future expansion at Olympic Dam and evolving extensions to mine life at Ranger. These calculated values are therefore indicative only.

3.3. Average waste rock data

The total amount of waste rock, including low-grade ore, produced by uranium mining in Australia is quantified within a reasonable order of magnitude. Based on data in Table 2, about 175 Mt has been excavated to date (waste rock data for underground and most older mines are generally not available). The most significant sites for waste rock are Ranger, Mary Kathleen, Rum Jungle, Olympic Dam and Nabarlek. In the future, if the proposed expansion of Olympic Dam proceeds, this site alone may contain waste rock covering some 1600−4400 ha (depending on height, at 160 or 60 m, respectively) (BHPB, 2005).

The average uranium grades of the various waste rock piles are generally not available, though some data exist for Ranger, Nabarlek and Rum Jungle as compiled in Table 5. It can only be assumed that waste rock at other sites contains $<0.02\%$ U_3O_8. The quantity of waste rock is primarily due to Ranger and Mary Kathleen, and to a lesser extent by Rum Jungle and Olympic Dam.

Overall, the 1152 t of combined low-grade ore and waste rock produced per tonne of Australian uranium can be expected to have a grade between 0.01% and 0.03% U_3O_8. The average mass is about 519 kt/ha, and using a typical waste rock density of 2 t/m^3, this gives an expected height of about 26 m.

4. Estimated and measured radon exhalation and releases

The measurement of radon exhalation has only been undertaken in more recent decades, commensurate with improved understanding of radon management in uranium mining and milling. Many of the recent radon studies were undertaken as part of an Environmental Impact Statement (EIS) or to support technical aspects of a project's design (e.g. radiation protection for mine workers). There is still, however, a lack of comprehensive radon exhalation and release studies at most former and current uranium project sites in Australia. Most studies only report exhalation data and do not measure (or at least do not report) other important variables such as porosity, moisture content and measured or calculated radon diffusion coefficients, or the area and grade of the active radon source.

Table 2
Principal ore, tailings and waste data for Australian uranium mines and mills to December 2005 (Mudd, 2007)

	Operation	Ore milled (t)	Ore ($\%U_3O_8$)	Prod. (t U_3O_8)	Tailings ($\%U_3O_8$)	Tailings ^{226}Ra[a]	Low-grade ore and waste rock (t)	Other metals produced/ ores mined (±milled)[b]
Olympic Dam, SA	1988–2005[j]	85,396,312	0.075	41,234	~0.026[c]	7.65	~10,250,000	1957 kt Cu, 25.2 t Au, 253 t Ag
Ranger, NT	1981–2005[j]	30,772,000	0.310	85,121	0.033	32.1	~121,150,000	–
Nabarlek, NT	1980–1988	597,957	1.84	10,955	0.036	191.1	2,330,000	–
		157,000[d]	0.05–0.1		~0.02[i]	5.2		
Beverley, SA[e]	2001–2005[j]	~31,750 ML[f]	~0.18	4070	–	–	601 ML	–
	1998[h]	153 ML[h]		33.27[h]			2.686 ML[h]	
Honeymoon, SA[e]	1982[h]	(ISL[e])	~0.12	No data	–	–	41.2 ML	–
	1998–2000[h]			29.4[h]				
Mary Kathleen, QLD	1976–1982	~6,200,000	0.10	4801	~0.02	10.4	17,571,000	–
Small/pilot Mines	1970–1980	Various		≫12[h]	–	–	≫150,000[i]	–
Moline, NT	1956–1964	135,444	0.46	716.0	0.070	47.5	Unknown	152.6 kt CuAu and PbZnAg ore
Rockhole, NT	1959–1962	13,418	1.11	139.7	0.066	115.3	Unknown	–
Mary Kathleen, QLD	1958–1963	2,668,094	0.172	4091.8	~0.019	16.2	4,539,652	–
Radium Hill, SA	1952–1961	822,690	0.119	–	~0.02	0.52	Unknown	–
Port Pirie, SA	1955–1962	~153,400	~0.74	852.3	~0.10	76.8	Unknown	1500 t monazite
Rum Jungle, NT	1954–1971	1,496,641	0.35	3530	0.086	33.7	~18,027,000	2.6 Mt Cu ore/87 kt Pb ore
Small/pilot Mines[g]	1950s–1960s	9225[g]	0.92	–[g]	–[g]	~95.5	Unknown	–
Mt Painter, SA	1910–1934	~933	~2.1	~3 t[i]	–	–	Unknown	–
Radium Hill, SA	1906–1932	>2150	~1.4[i]	~7 t[i]	–	–	Unknown	–
Total		~128.4 Mt	0.146%	155,595	0.028%	15.2	~175 Mt	–

[a] ^{226}Ra in Bq/g based on measured data or assuming secular equilibrium and average ore grade.
[b] Such as base metal or other ores milled (e.g. copper at Moline, thorium/monazite at Port Pirie; though the Rum Jungle lead ore was not milled).
[c] Adjusted for coarse backfill and copper extraction (based on 94.6% of ore milled as tailings and assuming no uranium in coarse backfill).
[d] Low-grade ore experimentally heap leached.
[e] ISL involves chemical solutions only (in ML) and no physical extraction of ore.
[f] Includes some estimated data.
[g] Ore milled at Rum Jungle ('RJ'), not included in sub-totals.
[h] Pilot plant only.
[i] Data uncertain (approximate only).
[j] Still operating at end of 2005.

Table 3
Resources and dimensions of major uranium deposits in Australia (adapted from Mudd, 2007, and additional references)

Deposit	Resources			Approximate (or average) dimensions (m)				Additional references
	Ore (Mt)	($\%U_3O_8$)	(t U_3O_8)	Depth[a]	Length	Width	Thickness	
Honeymoon, SA	2.75	0.12	3300	100–120	1000	400	4.3	SCRA (2000)
Beverley, SA[b]	~10.4	0.18	~17,900	100–120	~4000	400–750	20–30	HR (1998)
Olympic Dam, SA[c]	3970	~0.04	~1,500,000	350	~5000	~400–2300	~400	Kinhill (1997)
Ben Lomond, QLD	2.98	0.23	6800	50–75	750	150	100	McKay and Miezitis (2001)
Ranger 1, NT[d]	19.78	0.321	63,500	1–20	500	300	~185	Kinhill and ERAES (1996), McKay and Miezitis (2001)
Ranger 3, NT[e]	53.0	0.16	~85,000	~20–30	900	500	~25–100	McKay and Miezitis (2001), Needham (1988)
Nabarlek, NT	0.76	1.84	10,955	2–5	230	10	85	Needham (1988)
Jabiluka 1, NT	1.36	0.25	3400	~25	350	225	Up to 35	Battey et al. (1987), McKay and Miezitis (2001)
Jabiluka 2, NT[f]	31.1	0.53	163,000	~80–120	1100	400	Up to 135	Battey et al. (1987), McKay and Miezitis (2001), Needham (1988)
Koongarra 1, NT	1.83	0.8	14,550	2–25	450	~30–100	100	Hegge et al. (1980), Needham (1988)
Koongarra 2, NT	0.77	0.3	2300	50–250	100	~30–100	Up to 200	Hegge et al. (1980)
Coronation Hill, NT	0.34	0.54	1850	~150	No data	No data	No data	McKay and Miezitis (2001)
Lake Way, WA	5.98	0.09	5200	2–10	~3000[g]	~2000[g]	1.5	McKay and Miezitis (2001)
Yeelirrie, WA	35.2	0.15	52,500	2–8	~9000[g]	Up to 1500[g]	3–4	McKay and Miezitis (2001)

[a] Average depth to start of economic mineralisation.
[b] Adjusted from resource prior to mining, after allowing for production of 3103 t U_3O_8.
[c] Resources at June 2005, excluding milled ore of 85.4 Mt at 2.62% Cu, 0.075% U_3O_8, 5.9 g/t Ag and 0.55 g/t Au.
[d] Completely mined and milled.
[e] Includes reserves and resources (December 2005) but not milled ore derived from Ranger 3 (~10.9 Mt at 0.20% U_3O_8).
[f] Mineralisation extends to depths of 600 m, possibly deeper (possible ore zone extensions are still untested to the east and south of the deposit).
[g] Mineralisation not continuous over this area.

The variation in the radon emanation coefficient with moisture content for Ranger and Jabiluka ores and laboratory tailings is shown in Fig. 3. Further studies on radon behaviour are given by Hart (1986), Lawrence (2006), Storm (1998), Strong and Levins (1982), and Todd (1998).

4.1. Pre-mining radon exhalation

The available pre-mining radon exhalation surveys are compiled in Tables 6 and 7. The pre-mining radon exhalation contours for the Koongarra and Yeelirrie deposits are shown in Figs. 4 and 5, respectively, with the pre-mining radon activity in soil at Nabarlek shown in Fig. 6. In general, it is only uranium deposits of sufficient size and which appear from a shallow depth that give rise to a significantly elevated radon exhalation at the surface (comparing Tables 3, 6 and 7). Some examples are the calcrete–carnotite deposits in Western Australia (Yeelirrie, Lake Way) and the unconformity deposits at Ranger and Nabarlek in the Northern Territory. Conversely, there is no significant mineralisation-related radon signature from Olympic Dam, Beverley, Jabiluka and others.

The use of radon techniques in uranium exploration has been performed in Australia, most notably at the Rum Jungle mineral field, NT (Stewart, 1968), at Yeelirrie, WA (Severne, 1978) and the Alligator Rivers Region, NT (Gingrich and Fisher, 1976), though it does not appear to have been widely adopted and is thus of limited use in the context of this paper.

4.2. Radon sources during open cut, underground, in situ leach mining

There are only scattered data on the exhalation and release of radon from either underground or open cut uranium mining (Table 8). The EIS estimates for some proposed mines are also included for comparison.

A detailed study of radon releases from underground uranium mines in the United States was given by Jackson et al. (1981), with further analyses by Hans et al. (1981). The dominant radon sources were ventilation shafts with

Table 4
Uranium mill tailings pile data for Australian projects to December 2005

Project	Tailings facility	Area (ha)	Mass[a]	Dry density	Volume	Depth	References
Radium Hill	No. 1 Dam	~8	~100,000 t	Unknown	Unknown	~ 2 m (?)	Hill (1986), Sheridan and
	No. 2 Dam	~32	723,000 t			~5 m (?)	Hosking (1960), Waggitt (1994)
Port Pirie	Surface dam	~30	151,550 t	Unknown	Unknown	~2 m (?)	Waggitt (1994), Wilkinson (1977)
Rum Jungle[b]	Surface deposition minus erosion[f]	34	~576,000 t	~1.7 t/m^3	~0.34 Mm^3	~1.0 m	DNT (1978), Kraatz (1998),
	In-pit (White's)	11	~600,000 t	~0.6 t/m^3 (?)	~1.0 Mm^3	No data	Kraatz and Applegate (1992)
	In-pit (Dyson's)	6	~500,000 t	~2.3 t/m^3 (?)	~0.22 Mm^3	No data	
Mary Kathleen	Surface dam	29	~8,900,000 t	~1.4 t/m^3 (?)	~6.4 Mm^3	~22 m (?)	MKU (1986), Ward (1985)
Rockhole[c]	Surface deposition minus erosion[f]	~2	~12,000 t	Unknown	Unknown	–	Waggitt (1994)
Moline[d]	Surface deposition minus erosion[f]	18	~202,000 t	~1.2 t/m^3	~0.188 Mm^3	~1.0 m	Bastias (1987), Waggitt (1994)
	Surface dam (as rehabilitated)	~6	~208,000 t	No data	No data	No data	
Nabarlek	In-pit (including heap leach wastes)	5	744,000 t	~1.3 t/m^3	~0.47 Mm^3	<65 m	Bailey (1989)
Ranger	Interim surface dam (to Pit #3)[e]	117	13,624,000 t	1.0 t/m^3	13.6 Mm^3	11.6 m	ERA (1984–2005), Li et al. (2001),
	In-pit (Pit #1)	51	~18,951,000 t	~1.38 t/m^3	~13.7 Mm^3	<150 m	Sheng et al. (2000), Sheng et al. (1997)
	In-pit (Pit #3)[e]	~75[e]	Not applicable	–	–	–	
Olympic Dam	Current surface dam	~750	~78,500,000 t	1.75 t/m^3	~45 Mm^3	~5.9 m	Mudd (2007)
	Proposed final dam	~1850	Up to ~4.1 Gt	–	–	<30 m	BHPB (2005)
Approximate total (Dec. 2005)		1046	123.01 Mt	~1.6 t/m^3	–	~14 m	

[a] Allows for extraction of uranium, base metals and removal of the coarse fraction where appropriate, though in general the reagents added during milling equals the mass removed (e.g. pyrolusite and acid).

[b] Data on tailings in the pits at Rum Jungle are very poor, data as used are approximate only. The surficial tailings were dumped in Dyson's open cut during rehabilitation.

[c] About half of the Rockhole tailings were removed and transported to Moline for reprocessing and emplacement in the mid 1980s.

[d] The Moline tailings were excavated, reprocessed for gold and emplaced in a new engineered dam in 1986–1987, including about 6000 t of tailings transported from Rockhole. Data include base metal tailings (due to mixing with uranium tailings). After this project, a medium-size gold project was undertaken during 1988–1992 (Moline Hill, see Anon., 1988; Miller, 1990), depositing some 2.3 Mt of gold tailings over the old uranium-base metal tailings.

[e] Expected quantity of tailings for Ranger's Pit #3, including the interim above ground dam, is of the order of 38 Mm^3 (depending on final mine plan but excluding Jabiluka).

[f] Removed during rehabilitation works.

Table 5
Waste rock data for selected Australian projects (Mudd, 2007)

Project	Deposit/mine	Low-grade ore[a]		Waste rock		Total area (ha)
		(Mt)	(% U_3O_8)	(Mt)	(% U_3O_8)	
Rum Jungle	White's	–	–	8.64	0.004	26.4
	Dyson's	0.0478	0.077	2.032	0.005	8.43
	Rum Jungle Creek South	0.116[b]	0.066	4.877	0.018	21.9
	Mt Burton	0.0035	0.072	0.254	–	3.28
	Mt Fitch	–	–	0.020	–	~0.5?
	Intermediate (Cu)	–	–	1.727	0.005	6.85
Nabarlek	Nabarlek	0.157	~0.05	2.33	0.013	6
Ranger	Ranger #1[c]	16.219	~0.075	22.338	<0.02	~200
	Ranger #3	>18.813	~0.070	>9.865	<0.02	
Olympic Dam	Olympic Dam	–	–	~10.25[d]	–	–
Mary Kathleen	Mary Kathleen (1956–1963)	0.566	–	3.864	–	64
	Mary Kathleen (total)	–	–	~22[e]	–	
Totals		>35.92	~0.072%	~81.832	~0.01%	~340

[a] Generally defined as >0.02% U_3O_8.
[b] Apparently processed at Rum Jungle between 1969 and 1971.
[c] Conflicting data exist – one estimate states that for Ranger #1 a total of 19.8 Mt of ore, 4.5 Mt of low-grade ore (~0.05–0.10% U_3O_8) and 55.5 Mt of waste rock and very low-grade ore (~0.02–0.05% U_3O_8) were mined (ERA, 1999).
[d] Waste rock is returned underground as backfill (though a small stockpile may exist at the surface in the short term).
[e] Total of low-grade ore and waste rock from 1956 to 1982.

only a minor contribution from waste and ore stockpiles, mine water and subtracting credit for background radon. Jackson et al. (1981) estimated a normalised radon release at 1088 GBq/t U_3O_8. An important aspect of these studies is the relationship demonstrated between radon releases and cumulative production, with older mines (higher total production) showing higher radon releases relative to younger mines.

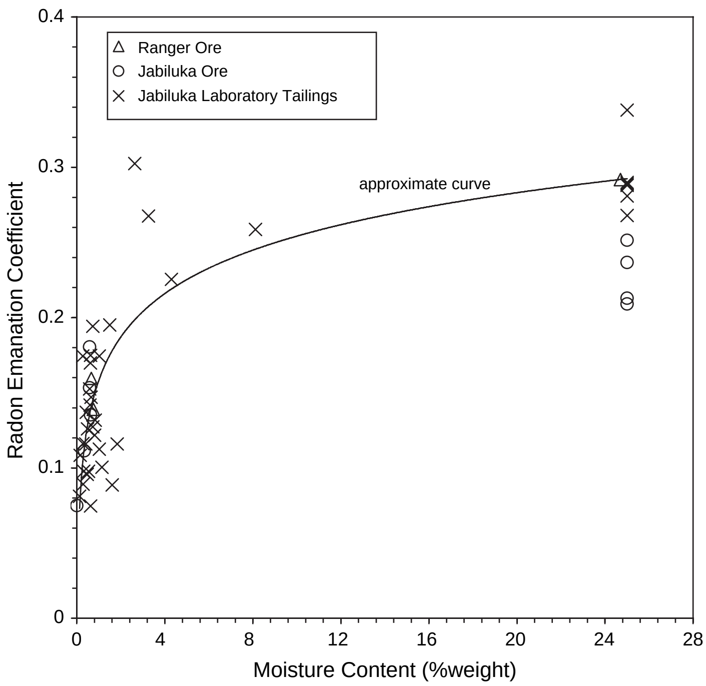

Fig. 3. Effect of moisture content on the emanation coefficient of Ranger ore and Jabiluka ore and laboratory tailings (Hart, 1986; Strong and Levins, 1982) (25% moisture assumed for saturated samples).

Table 6
Pre-mining and/or background radon exhalation and release surveys – Northern Territory

Location	Period or date of survey	Area (ha)	Exhalation ($Bq/m^2/s$)	Release (GBq/d)	References
Kakadu region – average[a]	Throughout 1998	–	0.030	–	Auty and du Preez (1994),
Kakadu region – range[a]	Various 1992–1998		0.009 → 0.057[b]		Todd (1998)
Kakadu–Magela Creek	August 2003 (31 samples)	–	0.21 ± 0.02	–	Lawrence (2006)
Kakadu–Mudginberri	April and Sept. 2003 (44 samples)		0.035 ± 0.02		
Kakadu–Mirray	March 2003 (45 samples)		0.039 ± 0.02		
Kakadu–Jabiru Water Tower	March and August 2003 (46 samples)		0.018 ± 0.01		
Kakadu–Jabiru East	August 2003 (45 samples)		0.043 ± 0.02		
Jabiluka 2[g]	Sept.–Dec. 1992	–	0.046	–	Auty and du Preez (1994)
Jabiluka Decline (east of #2)	Nov. 1992 and July–Aug. 1993		0.025		
Koongarra 1[g]	June 1978	12.53[c]	2.43[c]	26.1	Davy et al. (1978)
Koongarra 2[g]	June 1978	–	<0.05	–	Davy et al. (1978)
Nabarlek[g]	Sept. 1978	5	3.7 → 44.0[d]	–	Clark et al. (1981)
	June 1979		11.5 → 164.0[d,e]		
Nabarlek region	1999–2002	–	0.016 → 0.049	–	Bollhöffer et al. (2006)
			0.031 (average)		
Ranger 1[g]	~March 1978[f]	43[f]	3.8[f]	~141[f]	Haylen (1981)[f]
		91[f]	2.5[f]	~197[f]	
Ranger 1–3 region[g]	(Calculated estimate)	245	1.78	377	Kvasnicka and Auty (1994)
Ranger 1[g]		44	4.1	156	
Ranger 3[g]		66	2.5	143	
Area around 1 and 3		81	1.0	70	
Australian background	–	–	0.022 ± 0.005	–	Schery et al. (1989)

[a] Primarily in the near vicinity of the Ranger project area.
[b] Values >0.06 $Bq/m^2/s$ were detected above known as mineralisation (e.g. Ranger 2), ranging from 0.096 to 0.280 $Bq/m^2/s$ (three points excluded from average of 18 measurements).
[c] Average ^{222}Rn exhalation for 5.29, 3.69, 2.57, 0.79 0.13 and 0.063 ha is 0.57, 2.02, 4.07, 8.15, 13.18 and 20.76 $Bq/m^2/s$, respectively.
[d] Range given as minimum and maximum values only (no average).
[e] Vegetation cleared in preparation for mining.
[f] The AAEC report on this Ranger radon survey was apparently never completed. The data quoted are cited by Haylen (1981, p. 100) (Haylen worked for the AAEC in the late 1970s as a geologist). Further reference to this AAEC study is made in radon studies at Koongarra (Davy et al., 1978, p. 5), broader radiation studies at Nabarlek (Clark et al., 1981, p. 24; Davy, 1978, p. 78), as well as Yeelirrie, WA (Brownscombe and Davy, 1978, p. 14) while NTDME (1981, p. 8) also quotes the AAEC data.
[g] Above uranium deposit.

A difficult issue is estimating the actual radon released by *In Situ* Leach (ISL) mines, as currently in use at Beverley. The releases could be lower from ISL than conventional mining due to the lack of tailings and ore stockpiles, however, it is also likely that during operation the releases would be above normal baseline for the equivalent region being mined. An empirical model for estimating radon releases from ISL facilities was developed by Brown and Smith (1981), based on limited field sampling at an operational ISL mine. It was asserted that almost all of the radon released could be accounted for from the processing mill (99.95%) with a minor component from liquid waste storage ponds (0.05%). The well heads and waste scale buildup (e.g. calcite for their alkaline ISL project) were considered to be effectively 'zero'. The normalised radon release was estimated at 54 GBq/t U_3O_8, considerably lower than the 1088 GBq/t U_3O_8 estimate for underground uranium mining. Conversely, it was also estimated by Brown (1981) that an ISL mine has a normalised release rate of 143 GBq/t U_3O_8 (the discrepancy is unexplained).

4.3. Radon from ore, waste rock and low-grade ore stockpiles

As noted earlier, there is an increasing stockpile of ore, Waste Rock and Low-Grade Ore (WR–LGO) being produced in Australia. The available data for radon exhalation and releases are compiled in Table 9.

Table 7
Pre-mining and/or background radon exhalation and release surveys – South Australia and Western Australia

Location	Period or date of survey	Area (ha)	Exhalation (Bq/m²/s)	Release (GBq/d)	References
Honeymoon[d]	April–June, 1980	–	0.033	–	Whittlestone (1980)
	1998		0.038		SCRA (2000)
Beverley[d]	1980	–	0.044	–	AMDEL (1982)
Paralana Hot Springs[a]	1980	–	10.6	0.54	AMDEL (1982)
Olympic Dam[d]	June 1991–May 1992	–	0.025	–	WMC (1992)
			0.005 → 0.035		
Yeelirrie[d]	November 1976	–	3.7	2159	WMC (1978b)
	1981	675	0.5 → 8	–	Leach et al. (1983)
Yeelirrie – regional background	Early 1980s (various)	–	0.05 → 3.5	–	O'Brien et al. (1986)
	November 1976	–	~0.74	–	WMC (1978b)
Lake Way					
Inner mine area[b,d]	4–17 September 1979	310	0.30	80	Casteleyn et al. (1981)
Outer mine area [c,d]		390	0.126	42	
Regional background		–	0.044	–	
Australian background	–	–	0.022 ± 0.005	–	Schery et al. (1989)

[a] Approximately 15 km west of Beverley.
[b] Distance of 0–2 km.
[c] Distance of 2–3 km from centre of proposed operations.
[d] Above uranium deposit.

As can be expected, there is a notably wide variation in the radon exhalation and releases from waste rock, low-grade and ore stockpiles. Some data may not be reliable, as the values seem either too high or low (e.g. trial ore stockpile at Yeelirrie). Another example is Rum Jungle, where although a rehabilitation standard of 0.14 Bq/m^2/s was adopted, there was apparently no survey following rehabilitation works (1982–1986). At Yeelirrie, barometric

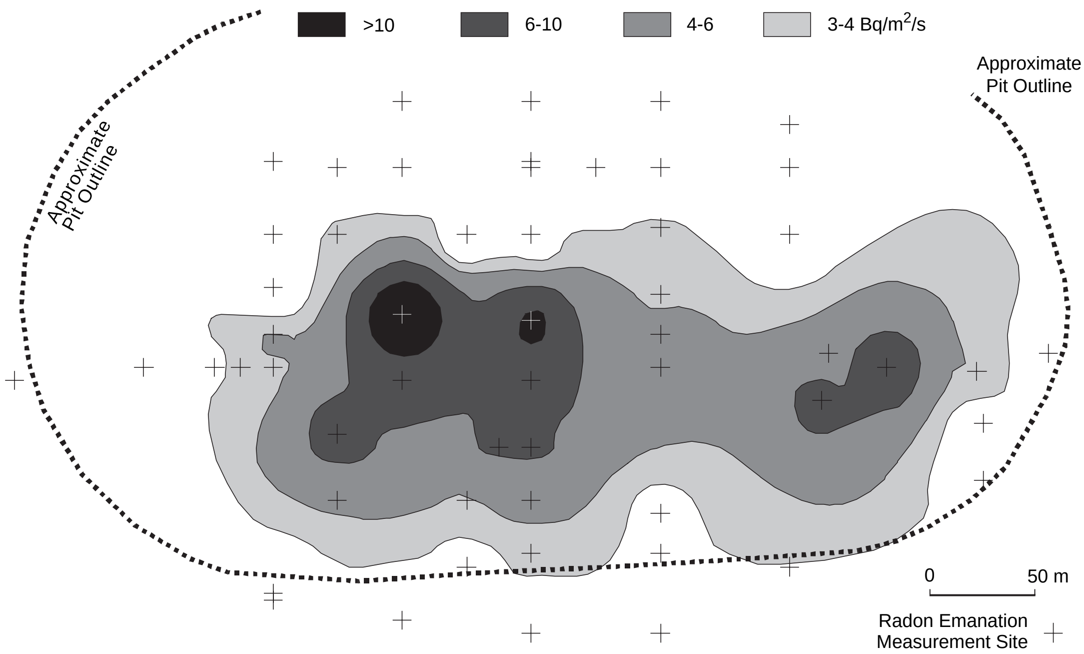

Fig. 4. Pre-mining radon exhalation measured at the Koongarra 1 uranium deposit, 1978 (mBq/m^2/s) (redrawn and adapted from Davy et al., 1978).

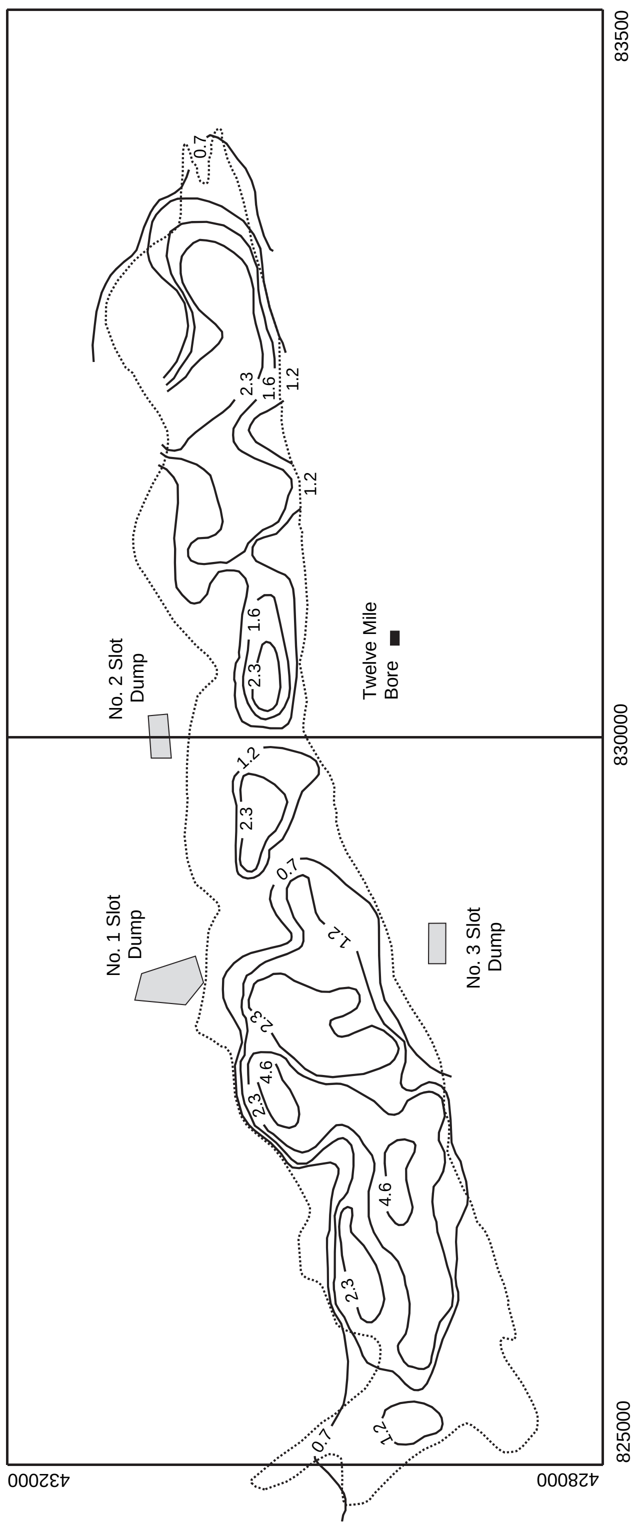

Fig. 5. Pre-mining radon exhalation measured at the Yeelirrie uranium deposit, June 1981 (Bq/m^2/s) (redrawn from Leach et al., 1983).

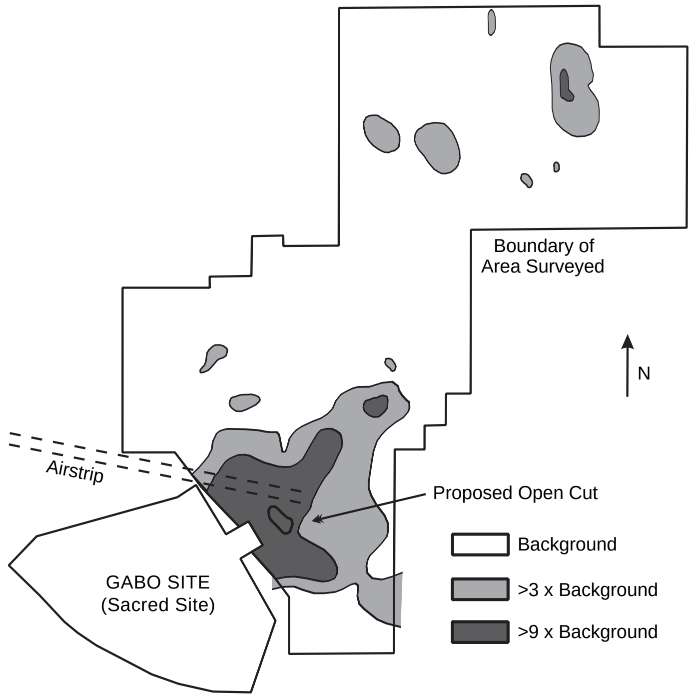

Fig. 6. Pre-mining radon activity in soil at Nabarlek (redrawn from QML, 1979).

pressure effects on radon exhalation have also been noted on early studies of the trial mine stockpiles (Brownscombe and Davy, 1978). The comprehensive study of the tropical Alligator Rivers Region by Lawrence (2006) shows clear seasonal behaviour in radon exhalation from waste rock dumps, related to the monsoonal wet season and resultant soil moisture (similarly, seasonal effects for radon activity in air have been noted earlier by Morley, 1981).

The effectiveness of rehabilitation works, such as engineered soil covers, could be expected to reduce radon exhalation somewhat though the sparse data are not convincing. For example, the study by Lawrence (2006) included radon exhalation measurements on an unnamed waste rock dump (<0.02% U_3O_8) and included a rehabilitated section. The radon exhalation was similar on both parts of the waste rock dump (see Table 9). Additionally, the study showed that radon exhalation cannot be expected to follow ore grade as the lower grade stockpile (the two stockpile, grade 0.02–0.08% U_3O_8) had a higher flux than the ore stockpile (the seven stockpile, grade >0.5% U_3O_8).

The radon released from normalised WR–LGO produced per GWe year could be based on previous mining data (i.e. 280 kt at ~0.02% U_3O_8 and 26 m high). Further discussion of waste rock and low-grade ore stockpiles is included in Sections 4.7 and 5.

4.4. Radon from milling

During the milling of uranium ore, radon can be released from dust, ore grinding, leach solutions, calcining and product packaging areas. To date, only total estimates for radon releases from mills have been made, almost entirely for EIS purposes for recent uranium projects. There still appears to be a lack of field measurements of radon releases from processing mills to verify EIS predictions. The available data are compiled in Table 10.

4.5. Radon from uranium mill tailings

One of the most significant (and controversial) sources of radon from uranium mining and milling, both during operation and after rehabilitation, is that from mill tailings. The predictions for radon exhalation and releases have varied significantly, depending on the chosen tailings management regime, although estimates for the same regime can also differ.

Table 8
Radon exhalation and releases from abandoned, operating, rehabilitated and proposed open cut and underground mines

Site	Source and conditions	Period of survey	Grade ($\%U_3O_8$)	Area (ha)	Exhalation ($Bq/m^2/s$)	Release (GBq/d)	References
Ranger	Pit #1 – wall (three samples)	Oct. 2003	–	–	0.30 ± 0.05	–	Lawrence (2006)
	Pit #1 – bench (33 samples)				0.50 ± 0.05		
	Pit #3 – rocks (two samples)				1.0 ± 1.0		
	Pit #3 – pad (25 samples)				2.5 ± 0.6		
	Pit #3 – rubble (nine samples)				1.7 ± 0.7		
Jabiluka	Calculated estimate (underground mine)	~1996 (for EIS)	–	–	–	121	Howes (1997)
	Decline and mining cross-cuts	July–Aug. 1999	1.15	–	~17.3	–	Sonter (2000)
Coronation Hill	Old mining tunnel (adit)	Late 1980s	–	–	0.036 ± 0.057	–	DM (1988)
	Abandoned open cut mine				0.67 ± 0.46		
Yeelirrie	Open pits (operating) (proposed)	1978 EIS est.	–	–	~4.7	2463	WMC (1978b)
	Open pits (post-mining) (proposed)	1978 EIS est.	–	605.6	~1.2	602	WMC (1978b)
	Open pits (operating) (proposed)	1979 EIS est.	–	–	–	1918	WMC (1979)
Koongarra	Open pit mine (proposed)	1978 EIS est.	–	–	–	23–57	Noranda (1978)
Olympic Dam	Underground mine (operating)	1980–81	–		0.3 → 1 (avg) → 3	–	Kinhill (1982)
	Underground mine (proposed)	1982 EIS est.	–		–	700	Kinhill (1982)
	Underground mine (operating)	Jun 1992–May 1993	~0.083		–	120	Davey (1994)
	Underground mine (operating)	~1996	~0.08		–	121	Howes (1997)
Ben Lomond	Open pit mine (proposed)	1979 EIS est.	–	–	–	22.9	Minatome (1979)
	Underground mine (proposed)					38.4	
Ben Lomond	Pit – exposed ore (proposed)	1983 EIS est.	–	1	10	8.6	Minatome (1983)
	Pit – barren rock (proposed)		–	10	0.3	2.6	
	Underground mine (proposed)		–	–	–	3.2	

The available data for tailings-derived radon are compiled in Tables 11 and 12, including the sites where some rehabilitation works have been undertaken to date. The radon exhalation contours at the former Moline and Rockhole tailings are shown in Fig. 7. In 1986, half of the Rockhole tailings were excavated and transported to Moline, which were also re-excavated with all tailings emplaced within a new gold tailings dam (Mudd, 2000). There is no known radon exhalation survey at Rockhole or Moline since this time. Further to this, there are no known radon exhalation surveys for the Radium Hill tailings (McLeary, 2004a) nor publicly available for the Mary Kathleen tailings (they were undertaken but remain confidential).

The efficiency of water covers in reducing radon exhalation from tailings was a central issue during the Ranger Uranium Environmental Inquiry (Fox et al., 1977), and remains a subject of some conjecture. For example, Chambers et al. (1998a) state that the radon released from Ranger's tailings to be 'zero', while other estimates for water covers have ranged between 7.4 (Fox et al., 1977) and 288 GBq/d (Davy, 1983), depending on the depth of water cover assumed. In the early years of operation, Davy (1983) estimated that exhalation from a 2-m water cover would be 0.8 $Bq/m^2/s$, arguing on overall environmental and economic grounds for dry tailings to achieve a radon exhalation of 0.5 $Bq/m^2/s$. The significant difference between these estimates is due to the different regimes used for assessment and the assumptions adopted for the estimate, with some clearly being too optimistic (such as the 'zero') while others appear more reasonable. To date, however, there is no public data on the field-measured radon exhalation from water over the tailings facilities at Ranger (which currently cover about 150 ha).

Studies in Brazil have shown that approximately one third of the radon in mine water retention ponds is released to the atmosphere (Paschoa and Nóbrega, 1981). Based on laboratory column studies, Rogers and Nielson (1981) argued that the water covers on mill tailings facilities were a major radon source, and presented a model to estimate such releases. Using this model, as implemented by Diehl (2006a) and using Ranger's 1996 tailings configuration (1996 Edition, ERA, 1984–2005), a total radon exhalation of 3.01 $Bq/m^2/s$ can be calculated for a release of 296 GBq/d from the above ground tailings facility (allowing for the tailings area to be 60% under water >1 m, 10% saturated and 30% unsaturated) (additional data for the calculation sourced from Hart, 1986; Kvasnicka, 1986).

Table 9
Radon exhalation and releases from abandoned, operating, rehabilitated and proposed ore stockpiles and waste rock stockpiles

Site	Source and conditions	Period of survey	Grade (%U_3O_8)	Area (ha)	Exhalation (Bq/m^2/s)	Release (GBq/d)	References
Rum Jungle	White's waste rock dump (12 points)	Dry season 1981	0.01	26.37	1.1	25	Mason et al. (1982)
	RJCS waste rock dump (36 points)	Dry season 1981	0.054	15	2.7	35	Mason et al. (1982)
	Proposed rehabilitation	–	–	–	0.14	–	Allen and Verhoeven (1986)
Nabarlek	Ore stockpile (prior to cover)	~Oct. 1979	1.86	2.9	130	326	Leach et al. (1982)
	Ore stockpile (after cover)	~ Nov. 1979			38	95	Leach et al. (1982)
	Waste rock dump (20 points)	Dry season 1981	0.013	–	0.26	–	Mason et al. (1982)
Ranger	Waste rock dump (WRD) (unspecified)	~1989	–	–	–	18.0	Kvasnicka (1990)
	Waste rock dump (unspecified)	Jan.–May 1995	–	–	0.47	–	Kvasnicka and Auty (1996)
	Waste rock dump (unspecified)	Sept. 1996	–	–	0.519	–	Todd (1998)
	Tailings dam wall (low-grade ore)	Dry season 1981	0.013	–	0.21	–	Mason et al. (1982)
	Laterite stockpile – pad (20 samples)	August 2002	–	–	5.2 ± 0.6	–	Lawrence (2006)
	Laterite stockpile – push (seven samples)	August 2002	–	–	81 ± 15	–	Lawrence (2006)
	Laterite stockpile – rim (13 samples)	August 2002	–	–	38 ± 5	–	Lawrence (2006)
	Ore stockpile 2 – pad (15 samples)	Sept. 2002	0.02–0.08	–	10 ± 2	–	Lawrence (2006)
	Ore stockpile 2 – rim (10 samples)	Sept. 2002	0.02–0.08	–	7.3 ± 2.2	–	Lawrence (2006)
	Ore stockpile 7 – pad (nine samples)	July 2002	>0.5	–	3.1 ± 0.7	–	Lawrence (2006)
	Ore stockpile 7 – rim (eight samples)	July 2002	>0.5	–	0.95 ± 0.35	–	Lawrence (2006)
	Ore stockpile 7 – push (five samples)	July 2002	>0.5	–	1.7 ± 0.7	–	Lawrence (2006)
	WRD – pad (20 samples)	July 2002	<0.02	–	0.53 ± 0.1	–	Lawrence (2006)
	WRD – rehabilitated (21 samples)	July 2002	<0.02	–	0.94 ± 0.1	–	Lawrence (2006)
	WRD – overburden (four samples)	July 2002	<0.02	–	0.97 ± 0.17	–	Lawrence (2006)
Coronation Hill	Nearby adjacent areas	Mid 1980s	–	–	0.18 ± 0.28	–	DM (1988)
	Approximate background		–	–	0.062 ± 0.007	–	
Koongarra	Ore stockpile (proposed)	1978 EIS est.	–	–	70–184	–	Noranda (1978)
	Waste rock stockpile (proposed)		–	–	9–26	–	

(*continued on next page*)

Table 9 (*continued*)

Site	Source and conditions	Period of survey	Grade (%U_3O_8)	Area (ha)	Exhalation (Bq/m^2/s)	Release (GBq/d)	References
Yeelirrie	Stockpiles (various) (proposed)	1978 EIS est.	0.44	417.8	~1.6	566	WMC (1978b)
	Stockpiles (post-mining) (proposed)	1978 EIS est.		417.8	~0.9	339	WMC (1978b)
	Waste rock (trial mine stockpile)	Nov. 1976		Small	0.0015	–	WMC (1979)
	Stockpiles (various) (proposed)	1979 EIS est.		~400	2.82	975	WMC (1979)
Olympic Dam	Ore stockpile (proposed)	1982 EIS est.	~0.08	–	–	8.6	Kinhill (1982)
Ben Lomond	Overburden (proposed)	1979 EIS est.	0.0008	–	–	0.7	Minatome (1979)
	Waste rock (proposed)		0.0033	13.6	–	3.6	
	Ore stockpile – mill (proposed)		–	–	–	1.2	
Ben Lomond	Waste rock (proposed)	1983 EIS est.	–	10	0.5	4.4	Minatome (1983)
	Low-grade ore (proposed)		–	5	4	17.2	
	Ore stockpile – mill (proposed)		–	1	10	8.6	

Table 10
Estimated or measured radon releases from uranium processing mills

Site	Current status	Date of survey/estimate	Release (GBq/d)	Capacity (t U_3O_8/year)	References
Ranger	Operating commercially	1974 and 1975 EIS estimates	44	3000	RUM (1974, 1975)
		1977 Ranger Inquiry estimate	20 → 148	3000	Fox et al. (1977)
		1989 and 1992 Research estimates	147	3000	Kvasnicka (1990, 1992)
		1993 Research estimates	150	3000	Akber et al. (1993)
Beverley	Operating commercially	1998 EIS estimate	~101	~1000	HR (1998)
Honeymoon	Commercial mill proposed	2000 EIS estimate	484	~1000	SCRA (2000)
Olympic Dam	Operating commercially	1982 EIS estimate	16.4[a]	3000	Kinhill (1982)
		June 1992 → May 1993	57[b]	1351[c]	Davey (1994)
Yeelirrie pilot mill	Care and maintenance	1978 EIS estimate	0.19	~12	WMC (1978a)
Yeelirrie	Undeveloped	1978 EIS estimate	311	2500	WMC (1978b)
Koongarra	Undeveloped	1978 EIS estimate	46[a]	1375	Noranda (1978)

[a] Includes evaporation ponds.
[b] Assuming all radon is released during grinding and leaching.
[c] Approximate actual production during period of measurements.

Of interest at Olympic Dam is the effect of shrinkage cracks on radon exhalation, with a field study given by Storm et al. (1997) and Storm (1998). Based on this data, cracks can significantly increase the radon exhalation, and though the full extent awaits further field or laboratory studies, it could be as high as an order of magnitude. The proposed radon exhalation for rehabilitated tailings storage facilities at Olympic Dam, according to the 1982 EIS (Kinhill, 1982), was 1 Bq/m^2/s. This compares to the regional background radon exhalation of about 0.025 Bq/m^2/s (WMC, 1992). The 1997 Expansion EIS (Kinhill, 1997) discussed the need to reduce radon exhalation at the time of rehabilitation, however, no rate or quantitative objective was presented.

It can be seen in Tables 11 and 12 that both predicted and measured radon exhalation vary considerably. The direct comparison of much of this data is hampered by the different field measurement techniques and lack of full reporting (or measurement) of data relevant to quantifying radon behaviour (especially moisture content).

Another important issue to note is the change in radon exhalation at Nabarlek following rehabilitation. Prior to mining, radon exhalation was of the order of 4−44 Bq/m^2/s (Table 6), whereas they presently average 1 Bq/m^2/s following rehabilitation (Table 11). This is clearly the product of improved environmental planning and design at modern uranium mines. At Nabarlek, the high grade ore body outcropped at the surface but during mining the ore was buried in the bottom sections of the mined out pit and only contaminated soils and waste rock were emplaced in the upper sections of the pit, which was capped using waste rock and some soils (see Klessa, 2001). If there was no signature from the tailings (or other radium-containing materials), the radon exhalation should be within regional background. As such, the rehabilitated radon exhalation of 1 Bq/m^2/s shows a signature from radium-bearing materials near the surface. This is most likely to be related to the waste rock and radium-rich evaporation pond sediments emplaced in the upper section of the pit. A recent issue identified at Nabarlek, however, is a small region (0.44 ha) showing a strong radiation exposure within a land unit known as 'Erosion Unit 7' (Bollhöffer et al., 2006; Hancock et al., 2006). This region shows a high radon exhalation of 6.5 Bq/m^2/s and is thought to be due to erosion of a thinner soil cover in this area and exposure of the underlying contaminated soils scraped from the evaporation ponds during rehabilitation works, although the strong disequilibrium between ^{238}U and ^{226}Ra could suggest mill tailings. As noted by Bollhöffer et al. (2006), it is important to understand radon exhalation in terms of the radium activity as well as physical properties such as porosity, grain size and rock coverage.

There are continuing management issues at most tailings sites, e.g. Rum Jungle (Pidsley, 2002), Nabarlek (Bollhöffer et al., 2003; Iles, 2005), Mary Kathleen (Lottermoser et al., 2003), Radium Hill (McLeary, 2004a), Port Pirie (McLeary, 2004b) and Rockhole (Cochrane, 2000). There is nothing publicly available to ascertain the current status of neither the Moline tailings nor the Yeelirrie pilot mill tailings just north of Kalgoorlie. In order to improve the prospects for future tailings management, a more coherent picture and quantitative framework are clearly required based on well defined and reported field-measured data (and not merely assumed or asserted values, such as 'zero').

Table 11
Radon exhalation and releases from abandoned, operating, rehabilitated and proposed uranium tailings piles – Northern Territory and Queensland

Site	Source and conditions	Period of survey	Area (ha)	Exhalation ($Bq/m^2/s$)	Release (GBq/d)	References
Rum Jungle	Unrehabilitated tailings	1977–78[a]	~35	2.1	64	Davy et al. (1978), Ritchie (1985)
	Proposed rehabilitation target	–	–	0.14	–	Allen and Verhoeven (1986)
Nabarlek	Unrehabilitated dry tailings (lab)	1980s	–	32.2	139	Kvasnicka (1986)
	Final in-pit tailings (calculated)	1988 and 1996	–	3.63/4.71	–	Storm and Patterson (1999)
	UNSCEAR (1993) advised data	–	5	2.1	9.1	UNSCEAR (1993)
	Predicted rehabilitated tailings	–	–	$\sim 10^{-22}$	–	Storm and Patterson (1999)
	Rehabilitated tailings (actual)	Aug.–Sept. 1999	4	1.03 ± 0.80	3.6	Martin et al. (2002)
	Rehabilitated tailings (actual)	1999–2002	4	0.97	3.4	Bollhöffer et al. (2006)
Nabarlek	Radioactive anomalous area ('Erosion Unit 7')[b]	Oct. 2002	0.44	6.51 ± 6.83	2.5	Bollhöffer et al. (2006), Hancock et al. (2006)
Rockhole	Unrehabilitated tailings	June 25–27, 1982	~2	~6 (average) $<5 \rightarrow 21.1$	10.4	Bastias (1987)
Moline	Unrehabilitated tailings	June 19–23, 1982	~18	~2 (average) $<1 \rightarrow 17.9$	31	Bastias (1987)
Ranger	Unrehabilitated dry tailings (lab)	1980s	–	10.4	–	Kvasnicka (1986)
Koongarra	Proposed operational tailings	1978 EIS est.	–	–	260	Noranda (1978)
Ben Lomond	Proposed operational tailings	1979 EIS est.[c]	6.8	24.5	144.1	Minatome (1979)
		1983 EIS est.	24	0.3	6.2	Minatome (1983)

[a] Based on unpublished data quoted in the references (no date given). Number of sampling points was 24 with an average ^{226}Ra activity of 26.5 Bq/g.
[b] The source of the radioactivity in 'Erosion Unit 7' is considered to be tailings and contaminated soils scraped from the former evaporation ponds (Bollhöffer et al., 2006, pp. 321–322).
[c] Estimated ^{226}Ra activity of 17.1 Bq/g.

4.6. Radon from radium-contaminated areas

The radon exhalation and releases from areas of radium contamination remain poorly quantified. In general, the main areas which have received significant radium due to uranium projects are downstream of Rum Jungle and water management areas at Nabarlek and Ranger. The Magela Land Application Area (MLAA) at Ranger, which receives mine site runoff waters from Retention Pond 2 (RP2) elevated in magnesium, sulfate, uranium and radium, has had approximately 8.6 GBq of radium applied over about 51 ha between 1985 and 2004 (land application presently continues) (compiled and estimated from ERA, 1984–2005). Early research into the soils of the MLAA suggests that the radium is adsorbed within the topmost 5–10 cm of soil (Akber and Harris, 1991; Willett et al., 1993). This suggests an approximate increase in soil radium activity of about 100–200 mBq/g (assuming 1.6 t/m^3 for topsoil), a range consistent with soil monitoring of the MLAA (pp. 80–84, 2002 Edition, ERA, 1984–2005). A recent field study of the MLAA showed a radon exhalation of 0.112 $Bq/m^2/s$ (Akber et al., 2004), with further details in Lawrence (2006). Given the MLAA area of about 75 ha, this gives a radon release of up to 7.3 GBq/d.

4.7. Total project radon releases

The total radon releases released by uranium projects across Australia are generally poorly understood with respect to changes from pre-mining or baseline conditions and relative to production levels. This is also complicated by the fact that the largest producer of tailings, Olympic Dam, produces uranium as a co-product with copper, gold and silver.

The total radon release for the Olympic Dam project, based on computer modelling of measured radon decay products, has been estimated as 518 GBq/d by Crouch et al. (2005). This value is somewhat lower than those in previous tables, though it should also be noted therein that actual measurements are often different to predicted values (including both higher or lower values).

Table 12
Radon exhalation and releases from abandoned, operating, rehabilitated and proposed uranium tailings piles – South Australia and Western Australia

Site	Source and conditions	Period of survey	Area (ha)	Exhalation ($Bq/m^2/s$)	Release (GBq/d)	References
Port Pirie	Unrehabilitated tailings	Survey 1 year	17.1[a]	1.9	27.8	AAEC (1980)
			4.5[b]	1.5 → 5.6 (avg) → 7.4	19.2	
Port Pirie	Covered tailings	Survey 1 year	17.1	0.12	1.8	Crouch et al. (1988), Hill (1986), Spehr (1984)
Olympic Dam	Proposed tailings (operating)	1982 EIS est.	400	0.6	207	Kinhill (1982)
	Covered Tailings	1982 EIS est.	400	1	346	Kinhill (1982)
	Operating Tailings	Jun 1997–Mar. 1998	380	1.24 → 3.5 (avg) → 8.2	1150	Storm (1998)
	Trial Covered Tailings	Mar. 1998	–	0.88	–	Storm (1998)
Lake Way	Proposed tailings (post-mining)	1981 EIS est.	–	0.75	–	BLA (1981)
Yeelirrie	Proposed tailings (operating)[c]	1978 EIS est.	330.3	~2.0	586	WMC (1978b)
	Proposed tailings (post-mining)	1978 EIS est.	330	~11.4	3261	WMC (1978b)
	Proposed tailings (operating)	1979 EIS est.	330	38.5	10,980	WMC (1979)

[a] Total area.
[b] Cells 2 and 3 only (majority of tailings).
[c] Includes radon sourced from pit dewatering operations (0.3 ha) pumped to the tailings dam for evaporation.

A realistic site for total release estimates is Ranger, since estimates for most components of radon releases are available. A preliminary compilation for total radon releases at Ranger is given in Table 13. It is noteworthy that the various estimates over time by different authors are quite variable, and perhaps even counter-intuitive to what could be expected. For example, a comparison of the pre-mine estimates with operational pit radon releases would

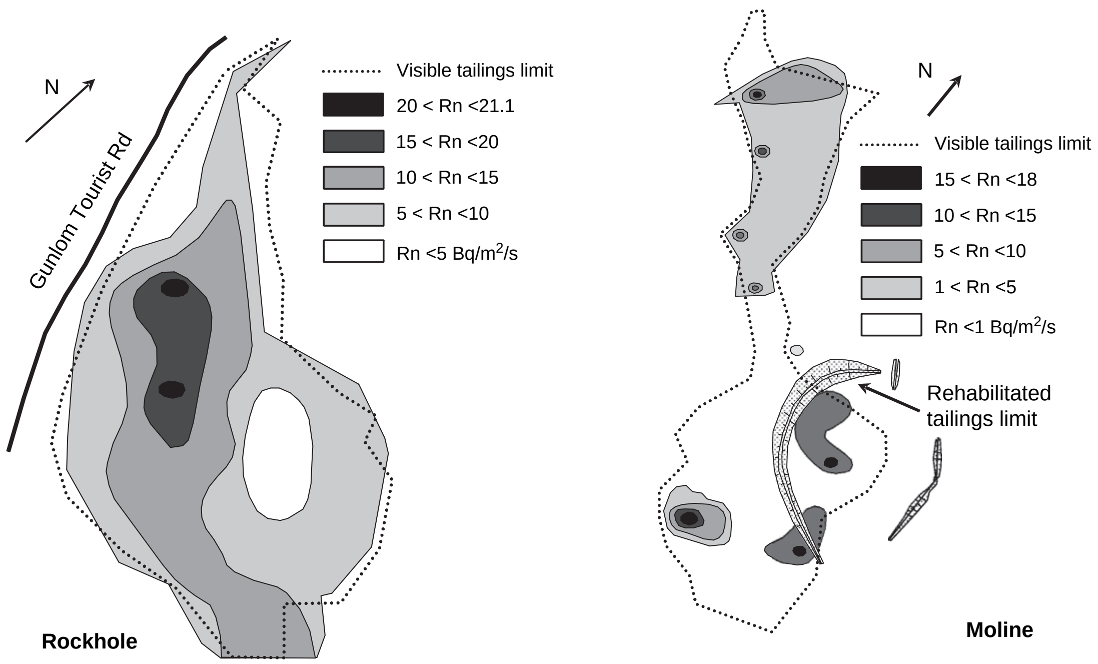

Fig. 7. Radon exhalation contours for uranium mill tailings before rehabilitation at Rockhole and Moline, June 1982 (no scale available) (redrawn from Bastias, 1987).

Table 13
Radon release estimates over time for the Ranger uranium project (GBq/d) (adapted from Mudd, 2002)

Year	Tailings management	Mill	Ore SP	WR	Pits	Tailings	Total	Reference
Pre-mine	–	0	0	0	372	5[a]	377	Auty and du Preez (1994)
1975	>2 m water cover	44	19[b]	–	32	<0.37	96	RUM (1975)
1977	–	20–148	~96[b]	–	20–281	14–144	150–669	Fox et al. (1977)
1981	Bare tailings (<12% moisture)	–	–	–	–	4105	–	Haylen (1981)
1981	Covered tailings (1 m clay, 2 m soil)	–	–	–	–	48	–	Haylen (1981)
1980s	Sub-aqueous deposition	–	–	–	–	197	–	Davy (1983), Author[c]
1989	Sub-aqueous and aerial deposition	147	318	18	34	148	665	Kvasnicka (1990)
1992	–	147	318	8	44	96	613	Kvasnicka (1992)
1993	Sub-aerial deposition	150	325	15	26	94	610	Akber et al. (1993)
1990s	Sub-aqueous and aerial deposition	–	–	–	–	77	–	Davy (1983)
1990s	Sub-aqueous and aerial deposition	–	–	–	–	296	–	Author[c]
2000s	Sub-aqueous and aerial deposition	150[c]	80[c,1]	163[c,2]	54[c,3]	299[c,4]	~750[c,5]	Author[c]

[a] Assuming a pre-mining exhalation of 0.05 $Bq/m^2/s$.
[b] Includes waste rock. WR, waste rock; SP, stockpiles.
[c] Values calculated/adopted from previous tables, as well as including new data from Lawrence (2006); [1]5 $Bq/m^2/s$ over 18.5 ha; [2]1 $Bq/m^2/s$ over 188.4 ha; [3]1 $Bq/m^2/s$ over 62.0 ha; [4]above ground dam and Pit #1; [5]includes small allowance for land application areas (as noted in Section 4.6).

suggest that open cut mining is actually leading to a lower radon release whereas logic would expect an elevated release due to the significantly increased surface area open to the atmosphere. The estimate of 4105 GBq/d from tailings by Haylen (1981) is an extreme estimate in comparison to others in Table 13 but is kept for completeness.

A compilation of the total of radon sources and uranium production levels is given in Table 14, to allow an estimate of the radon release relative to uranium production (i.e. GBq/t U_3O_8). The estimates, after allowing for data gaps, show that the radon release per tonne of uranium is quite variable and commonly between 30 and 100 GBq/t U_3O_8. For comparison to earlier ISL data (54–143 GBq/t U_3O_8), the Beverley acid leach mine releases approximately 37 GBq/t U_3O_8. There is little apparent difference between ISL, open cut and underground mining for Australian-produced uranium.

The UNSCEAR analyses (and others critiquing them) have only assumed radon is released in the long-term from mill tailings. This fails to account for what is often the biggest source by mass and area – waste rock and low-grade ore, as well as other components which can sometimes provide significant radon releases, such as contaminated areas and abandoned mines. From an environmental and radiological perspective, it is the long-term success of rehabilitation and the cumulative changes from baseline which should be used as the basis for standards and assessing the local and global radiological consequences of uranium projects.

At current uranium projects, radon progeny is monitored in the surrounding environment, public radiological doses are estimated and provided these meet the relevant statutory requirements (i.e. <1 mSv/year), no further work has been considered necessary. This approach is inadequate, however, when setting rehabilitation standards and estimating long-term global doses as the releases are needed relative to the sources and operations at a specific uranium project. That is, we need to have a reliable estimate of the total radon released from the various source terms. Additionally,

Table 14
Predicted radon releases per unit Australian uranium production (GBq/t U_3O_8)

Project	Production	Radon release (GBq/d)							Unit release (GBq/t U_3O_8)	
	(t U_3O_8/year)	Mine	WR	Ore SP	Mill	Tailings	Minimum	Maximum	Minimum	Maximum
Beverley	1000				101		101	101	36.9	36.9
Ranger	5000	20–281	8–18	19–325	0–150	<0.4–299[a]	47.4	1073	3.5	78.3
Olympic Dam	4500	120–700			16–57	207–1150	343	1907	27.8	154.7
Yeelirrie	2500	600–2500	340–1000		311	586–11,000	1837	14,811	268.2	2162.4
Koongarra	1375	23–57			46	260	329	363	87.3	96.4
Ben Lomond	500	10–38	1–17			6–144	17	199	12.4	145.3
Nabarlek	1360		95			5–139	100	234	26.8	62.8

[a] Excluding the estimate by Haylen (1981) for bare, dry tailings as Ranger's tailings have never been operated in this manner.

it should be recognised that the changes in radon releases from uranium projects are cumulative across the industry (including reductions). Radiological monitoring and assessment should be also designed and undertaken in such a way as to include the ability to compare against pre-mining (or natural) conditions and how rehabilitation plans can be designed to achieve, at the very least, this level of performance. In this way, the cumulative changes across the industry can be argued to meet the ALARA principle and minimise doses.

5. Discussion

There are two major difficulties with estimating total radon releases from Australian uranium projects: (i) the lack of comprehensive data over time (including comprehensive pre-mining studies) and (ii) differing methods and focus giving rise to inconsistent measurements and reporting. Aspects of these problems include either no measured or reported radium activity, moisture content, density or porosity. It is noted by Bollhöffer et al. (2003), in discussing the different radon exhalation values at the rehabilitated Nabarlek site, that discrepancies in measurement techniques and sample locations can affect overall results. Further significant issues are the geology and mining conditions for each deposit and the fact that almost all studies lack consistency on measuring or reporting moisture data. Given the critical importance of moisture and climatic differences, this remains a vexed issue. It is likely that these factors could explain, at least partly, some of the data variability within the tables.

Overall, this makes the direct comparison and use of the data somewhat problematic. Therefore, the detailed data compiled within this paper should be taken as indicative only. It should be emphasized that an assessment or calculation of radon releases from proposed and operating uranium projects should include all source term components (e.g. mine, mill, waste rock, stockpiles, tailings and mine site water ponds). The use of accurate field-measured data should be given the highest priority for studies on operating sites. For proposed sites, advantage can be taken of pilot milling and metallurgical research on ores to establish tailings' parameters, exploration data from drill cores, and so on. The practice of simply assuming data and other properties (as appears to be commonly undertaken in Australia at least) should be discouraged. The UNSCEAR analyses (UNSCEAR, 1993, 2000) both used assumed or approximated data for Australia – despite the available data from Australia (ignoring the somewhat disperse and often obscure location of some of the radon data).

It can be noted in the tables that for some older sites, both rehabilitated and abandoned, there is evidence of ongoing erosion problems leading to locally elevated radon exhalation (e.g. Nabarlek). Although measurements may be taken at a point in time, it is important to continually monitor and re-assess the radon sources of all sites, especially where population is nearby (e.g. Port Pirie) or some form of further land use is expected (e.g. Nabarlek).

In comparison to the UNSCEAR data, it would appear that Australia's equivalent tailings data are similar in dry density at 1.6 t/m^3 and also area at 0.95 ha/GWe year. To produce the 250 t U_3O_8 for 1 GWe year requires about 212 kt of 0.146% U_3O_8 ore, with radium 15.2 Bq/g and a tailings thickness of about 14 m. In addition, some 288 kt of waste rock and low-grade ore is produced at an approximate average of 0.02% U_3O_8, with radium 2.1 Bq/g and covering about 0.55 ha to a height of about 26 m. The radon releases can be predicted for these wastes using an online version of the US Nuclear Regulatory Commission's 'RAECOM' radon model (Rogers et al., 1984), as implemented by Diehl (2006b). The results are shown in Table 15. The UNSCEAR data, 3 Bq/m^2/s from 1 ha of tailings only, give a radon release of 2.6 GBq/d – compared to a possible range of radon releases for Australian-produced uranium of 2.9–12.6 GBq/d (tailings plus waste rock and low-grade ore). The total radon release depends on the combination of moisture content and emanation coefficient adopted, however, in any case the radon releases from Australian-produced uranium are likely to be higher than that assumed by UNSCEAR data. Rehabilitation works could reduce the long-term radon release but the field evidence is not convincing (e.g. erosion problems at Nabarlek leading to locally higher radon exhalation).

Given the widely varying conditions and compiled data, however, a standardised rate per GWe year is clearly not realistic; instead, site-specific and comprehensive field studies should be used. As noted previously, however, the UNSCEAR-style approach above ignores the additional sources from uranium projects, such as waste rock and contaminated areas, which can also be significant sources as shown in Tables 9 and 14. The long-term radon releases from waste rock and/or contaminated areas would clearly depend on the extent and effectiveness of rehabilitation works, with the sites for which actual post-rehabilitation radon exhalation data exist being restricted to Port Pirie and Nabarlek. In order to keep within the ALARA principle, it is therefore important to ensure that changes in radon releases are minimised – including waste rock, tailings and other potential sources.

Table 15
Predicted normalised radon exhalation and releases from Australian uranium for a standard reactor year (1 GWe year)

Waste	Moisture condition	Moisture (%dry weight)	Emanation coefficient	Exhalation (Bq/m^2/s)	Release (GBq/d)
Tailings	Dry	0.1	0.1	7.82	6.4
Tailings	Moist	8	0.25	14.17	11.6
Tailings	Saturated	31.3[a]	0.3	2.80	2.3
Waste rock and low-grade ore	Dry	0.1	0.1	1.23	0.58
Waste rock and low-grade ore	Moist	8	0.25	1.94	0.2
Waste rock and low-grade ore	Saturated	26.8[b]	0.3	0.15	0.07

[a] Saturated moisture based on calculated porosity of 0.50, based on the estimated average tailings particle density ('specific gravity') of about 3.2 (see tailings in Section 3.2).
[b] Saturated moisture based on calculated porosity of 0.43, based on the assumed waste rock particle density ('specific gravity') of about 2.8.

6. Conclusions

This paper has presented a detailed compilation and analysis of radon exhalation and releases from Australian uranium mining and milling projects. The primary purpose was to estimate normalised tailings and waste rock data and radon exhalation and release rates for a standard reactor year of uranium production to assess the efficacy of the UNSCEAR approach to long-term radon release from uranium mining (and consequent global population radiological doses). Overall, the UNSCEAR data for solid waste parameters are reasonable though it ignore potential major sources such as waste rock and low-grade ore. The extensive Australian data compiled for radon exhalation and releases for the various components of uranium mining and milling demonstrate wide variation and data quality, and show that waste rock and low-grade ores can be significant sources of radon. Importantly, the evidence on the effectiveness of rehabilitation works in reducing radon exhalation and releases is not convincing, especially when comparing cumulative changes from pre-mining conditions. Further work is required to ascertain whether this is due to design conflicts between revegetation or radon exhalation reduction requirements for engineered covers. When adopting more realistic data for tailings and waste rock, the UNSCEAR approach appears to underestimate the radon released from a standard reactor year of uranium production, though this needs to be moderated by the uncertain long-term effectiveness of engineered rehabilitation works. This paper has also shown that there is potential for uranium mining and milling to increase long-term radon releases into the adjacent environment relative to baseline or pre-mining conditions. In summary, these issues remain to be recognised in the broader debate about life-cycle analyses of uranium mining and nuclear power.

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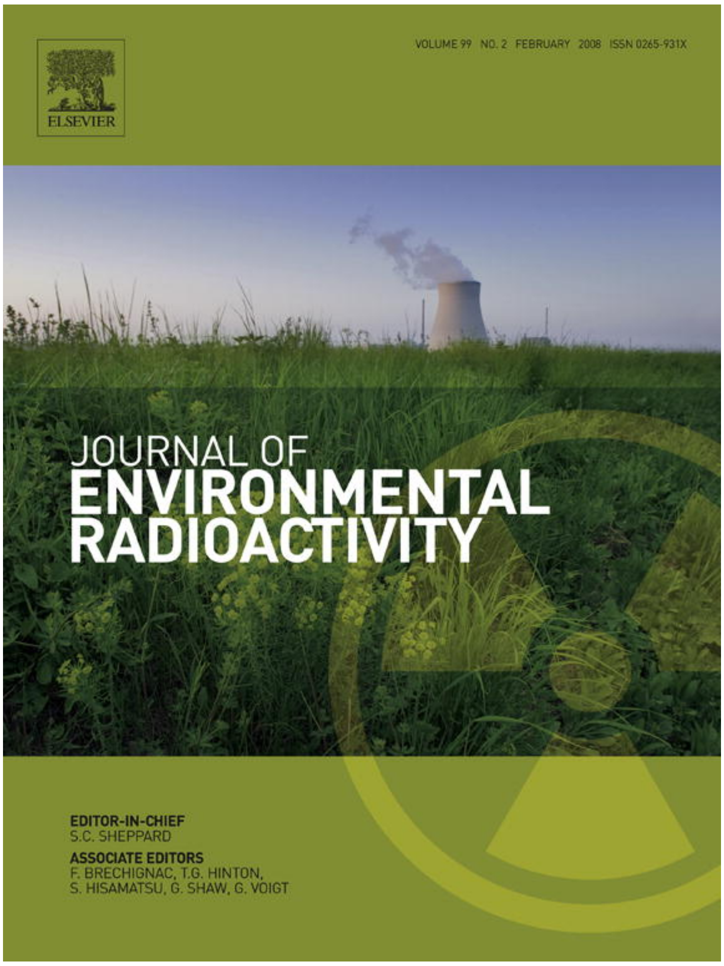
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Reid Rosnick

To

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Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings.msg

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-----Original Appointment-----
From: Rosnick, Reid **On Behalf Of** Echols, Mabel E.
Sent: Friday, September 27, 2013 1:17 PM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: FW: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Monday, October 07, 2013 1:00 PM-1:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

When: Monday, October 07, 2013 1:00 PM-1:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

Note: The GMT offset above does not reflect daylight saving time adjustments.

~~*~*~*~*~*~*~*~*

FYI

-----Original Appointment-----
From: Echols, Mabel E. [mailto:Mabel_E._Echols@omb.eop.gov]
Sent: Friday, September 27, 2013 1:15 PM
To: Echols, Mabel E.; Mancini, Dominic J.; Laity, Jim; Higgins, Cortney; Schwab, Margo; Finken, Anne; Birchfield, Norm; Li, Jia; Bruce_D_Rodan@ostp.eop.gov; Rosnick, Reid; Schultheisz, Daniel
Subject: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Monday, October 07, 2013 1:00 PM-1:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

This meeting was requested by Katie Sweeney, National Mining Association.

EPA-2898

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Accepted E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings.msg

- Accepted E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings.msg

-----Original Appointment-----
From: Rosnick, Reid
Sent: Friday, September 27, 2013 1:38 PM
To: Echols, Mabel E.
Subject: Accepted: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Monday, October 07, 2013 1:00 PM-1:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

EPA-2952

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (6).msg

- FW E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (6).msg

-----Original Appointment-----
From: Rosnick, Reid **On Behalf Of** Echols, Mabel E.
Sent: Friday, September 27, 2013 1:18 PM
To: Stahle, Susan
Subject: FW: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Monday, October 07, 2013 1:00 PM-1:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

When: Monday, October 07, 2013 1:00 PM-1:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

Note: The GMT offset above does not reflect daylight saving time adjustments.

~~*~*~*~*~*~*~*~*

-----Original Appointment-----
From: Echols, Mabel E. [mailto:Mabel_E._Echols@omb.eop.gov]
Sent: Friday, September 27, 2013 1:15 PM
To: Echols, Mabel E.; Mancini, Dominic J.; Laity, Jim; Higgins, Cortney; Schwab, Margo; Finken, Anne; Birchfield, Norm; Li, Jia; Bruce_D_Rodan@ostp.eop.gov; Rosnick, Reid; Schultheisz, Daniel; Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Monday, October 07, 2013 1:00 PM-1:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

This meeting was requested by Katie Sweeney, National Mining Association.

EPA-2925

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\EPA Attendees for E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings.msg

- EPA Attendees for E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings.msg

From: Rosnick, Reid
Sent: Monday, September 30, 2013 3:40 PM
To: Echols, Mabel E.
Subject: EPA Attendees for E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings

Hi Ms Echols,

Here is the EPA list of attendees for the referenced meeting on 7 October with OMB and the National Mining Association:

Reid Rosnick
Dan Schultheisz
Susan Stahle

Please let me know if you need more information. Thank you.

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-2930

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Follow Up of Today's Subpart W Conference Call.msg

- Follow Up of Today's Subpart W Conference Call.msg

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Thursday, October 17, 2013 3:39 PM
To: Stahle, Susan
Cc: Rosnick, Reid
Subject: Follow Up of Today's Subpart W Conference Call

Dear Ms. Stahle,

As a follow up of this mornings Subpart W Review conference call, I would like some additional information.

In response to my question regarding the NEPA review for the proposed rule, you stated that the EPA Clean Air Act rulemakings are exempted from NEPA. citing Section 307. I looked at Section 307 of the Clean Air Act and could not find any indication of such an exemption.

However, Section 312, appears to require an analysis on the impacts to public health, economy, and the environment for a Subpart W rulemaking.

Considering the fact that the EPA produced an Environmental Impact Statement for the promulgation of the Radionuclide NESHAPS in 1989, I assumed that the EPA would supplement that EIS for this proposed amendment to Radionuclide NESHAPS regulations. I must have missed something.

Please point me to the exact section and subsection that exempts this Subpart W rulemaking from any NEPA analysis. Please explain why there was an EIS in 1989, but the EPA is not supplementing that EIS for this rulemaking.

I did see in Section 307 that the EPA is required to make the documents related to the OMB and inter-agency consultation available on the docket prior to the release of the Proposed Rule. Section 307(d)(4)(B)(ii). The availability of these documents was discussed in today's call.

Also, I see that the EPA "shall give interested persons an opportunity for the oral presentation of data, views, or arguments, in addition to an opportunity to make written submissions." Section 307(d)(5). That opportunity has not been mentioned in the conference calls. I would be helpful to know how the EPA will be providing opportunities for oral presentations in this Subpart W rulemaking.

Thank you,

Sarah Fields
Program Director
Uranium Watch
PO Box 344

Moab, Utah 84532
435-210-0166 (mobile)

EPA-2897

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Accepted E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (8).msg

- Accepted E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (8).msg

-----Original Appointment-----
From: Rosnick, Reid
Sent: Monday, October 21, 2013 12:09 PM
To: Echols, Mabel E.
Subject: Accepted: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Wednesday, November 13, 2013 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

EPA-2964

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Follow Up of Today's Subpart W Conference Call.msg

- FW Follow Up of Today's Subpart W Conference Call.msg

From: Rosnick, Reid
Sent: Monday, October 21, 2013 2:08 PM
To: Miller, Beth
Subject: FW: Follow Up of Today's Subpart W Conference Call

Hey Beth,

Will you please post this email exchange in the email section of the Subpart W website. Thank you.

BTW, minutes from the October 17 stakeholder call will be coming shortly, but please post the email first (It's mentioned in the minutes). Thanks.

From: Stahle, Susan
Sent: Thursday, October 17, 2013 5:37 PM
To: sarah@uraniumwatch.org
Cc: Rosnick, Reid
Subject: RE: Follow Up of Today's Subpart W Conference Call

Hi Sarah –

I cited Clean Air Act (CAA) section 307 not as support for why EPA is not required to comply with NEPA when taking action under the CAA; instead, I cited CAA section 307 as applicable to the public notice and comment process we were discussing on the call today.

Section 7(c) of the Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. 793(c)(1)) exempts actions under the Clean Air Act from the requirements of NEPA. Section 793(c)(1) states: "No action taken under the Clean Air Act shall be deemed a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 (83 Stat. 856) [42 USCS §§ 4321 et seq.]." This is why EPA is not required to conduct a NEPA analysis for this Subpart W rulemaking.

I see that EPA issued a DEIS for the 1989 radionuclide rules, but I do not see a final EIS for those rules. I don't know whether that document was prepared for NEPA purposes, or whether it was prepared for other analytical purposes. The document itself does not indicate that it was for NEPA compliance purposes. It may be that EPA prepared that document for other analytical purposes, I just don't know. Regardless of the reasons for that document back in 1989, EPA does not have a legal obligation to prepare those documents for NEPA compliance purposes for this Subpart W rulemaking. However, please note that EPA is preparing the requisite background documents for this rulemaking and those will be available for public review and comment when we publish the proposal for public notice and comment.

The analyses required under CAA section 312 is a "comprehensive analysis" of all EPA rules issued under the CAA prior to November 15, 1990. According to section 312(d), that report was due to Congress back in 1991. Thus, I do not believe section 312 is applicable to this rulemaking. However, please understand that EPA is preparing the appropriate cost and benefit analyses for this rulemaking as required by other statutes and Executive Orders, and those analyses will be available for your review once we publish the proposal.

The opportunity you note for oral presentations in CAA section 307(d)(5) will be addressed in the proposed rule. In the proposal, we will specifically offer the public the opportunity to request a public hearing on the proposed rule. If we receive such a request, we will hold a public hearing, and the public will have the opportunity to make oral presentations at that public hearing. More details on this process will be contained in the proposal.

I hope this answers your questions.

Susan Stahle
EPA/OGC/ARLO
202-564-1272

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Thursday, October 17, 2013 3:39 PM
To: Stahle, Susan
Cc: Rosnick, Reid
Subject: Follow Up of Today's Subpart W Conference Call

Dear Ms. Stahle,

As a follow up of this mornings Subpart W Review conference call, I would like some additional information.

In response to my question regarding the NEPA review for the proposed rule, you stated that the EPA Clean Air Act rulemakings are exempted from NEPA. citing Section 307. I looked at Section 307 of the Clean Air Act and could not find any indication of such an exemption.

However, Section 312, appears to require an analysis on the impacts to public health, economy, and the environment for a Subpart W rulemaking.

Considering the fact that the EPA produced an Environmental Impact Statement for the promulgation of the Radionuclide NESHAPS in 1989, I assumed that the EPA would supplement that EIS for this proposed amendment to Radionuclide NESHAPS regulations. I must have missed something.

Please point me to the exact section and subsection that exempts this Subpart W rulemaking from any NEPA analysis. Please explain why there was an EIS in 1989, but the EPA is not supplementing that EIS for this rulemaking.

I did see in Section 307 that the EPA is required to make the documents related to the OMB and inter-agency consultation available on the docket prior to the release of the Proposed Rule. Section 307(d)(4)(B)(ii). The availability of these documents was discussed in today's call.

Also, I see that the EPA "shall give interested persons an opportunity for the oral presentation of data, views, or arguments, in addition to an opportunity to make written submissions." Section 307(d)(5). That opportunity has not been mentioned in the conference calls. I would be helpful to know how the EPA will be providing opportunities for oral presentations in this Subpart W rulemaking.

Thank you,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84532
435-210-0166 (mobile)

EPA-3229

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Stakeholder call minutes.msg

- Stakeholder call minutes.msg

From: Rosnick, Reid
Sent: Monday, October 21, 2013 2:09 PM
To: Miller, Beth
Subject: Stakeholder call minutes

☺

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Subpart W Stakeholders Conference Call
October 17, 2013

ATTENDEES

EPA: Reid Rosnick, Susan Stahle

Environmental Groups: Sarah Fields, Uranium Watch; Jennifer Thurston, INFORM

Uranium Industry/Other: Kim Morrison, Energy Fuels: Steve Cohen, Darryl Liles, Randy Weider, SENES

UPDATE

Reid began the call with a welcome and by taking attendance. Reid had one item to share. We have been addressing the OMB comments and will be scheduling a briefing for the OMB desk officer soon. The responses to the comments consist of language changes to the preamble, further clarification of some issues in the Background Information Document and Economic Impact Analysis and some legal authority questions from an Interagency review of the package. We continue to be on track for a proposed rule in last autumn, although the government shutdown slowed our progress. Reid will update the expected date of proposal on the website.

DISCUSSION

Sarah Fields: Have you requested comments on the proposal from Agreement States, Utah in particular? Have you communicated with the NRC? Have you followed the process for a NEPA review?
Reid: We have not specifically requested comment from Agreement States. Our process to this point is internal to the federal government. However, when the rule is proposed, we welcome comments from all stakeholders, including Agreement States. We have a communication plan in place to make sure we reach as many stakeholders as possible. We will not just publish the proposal in the Federal Register and not tell anyone about it. Yes, we have communicated informally with the NRC over the past few years on the status of the proposal.
Susan Stahle: We are currently involved with OMB through their interagency review process. There are two processes for receiving comments on this proposal. EPA does not run this first process; OMB is currently in charge of receiving comments from other federal agencies. The individual agencies are not identified to EPA. It is possible that if OMB has requested comment on the package from NRC, NRC may have requested comments from pertinent Agreement States. We would not know of such an activity since OMB, and not EPA, is in charge of this review process.
The second process for receiving comment is EPA’s notice of proposed rulemaking where we publish notice of the proposed rule and ask for comment. We welcome all comments from any stakeholder.

This rulemaking is not subject to a NEPA review. This is a rulemaking under the Clean Air Act, and is exempted from the NEPA review process. (NOTE: Sarah Fields and Susan Stahle had an email exchange on this issue. You can find that exchange in the email section of the website))

Jennifer Thurston: Want to reiterate posting of OMB comments/responses on Subpart W website.
Reid: When we are ready to publish the proposal, we will post OMB's comments/responses on the website, and they will also be in the Subpart W docket.

Next call: Thursday, January 2, 2014 at 11 AM Eastern Time.

__________________________________end___________________________________

EPA-3006

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Stakeholder call minutes.msg

- FW Stakeholder call minutes.msg

From: Rosnick, Reid
Sent: Thursday, October 24, 2013 8:30 AM
To: Miller, Beth
Subject: FW: Stakeholder call minutes

Hi Beth,

I guess we need to put these minutes into the Subpart W docket, too.

Reid

From: Rosnick, Reid
Sent: Monday, October 21, 2013 2:09 PM
To: Miller, Beth
Subject: Stakeholder call minutes

☺

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Subpart W Stakeholders Conference Call
October 17, 2013

ATTENDEES

EPA: Reid Rosnick, Susan Stahle

Environmental Groups: Sarah Fields, Uranium Watch; Jennifer Thurston, INFORM

Uranium Industry/Other: Kim Morrison, Energy Fuels: Steve Cohen, Darryl Liles, Randy Weider, SENES

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Jennifer Thurston: Want to reiterate posting of OMB comments/responses on Subpart W website.
Reid: When we are ready to publish the proposal, we will post OMB's comments/responses on the website, and they will also be in the Subpart W docket.

Next call: Thursday, January 2, 2014 at 11 AM Eastern Time.

_________________________________end__________________________________

EPA-2953

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (9).msg

- FW E O 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (9).msg

-----Original Appointment-----
From: Rosnick, Reid **On Behalf Of** Echols, Mabel E.
Sent: Monday, October 28, 2013 5:23 PM
To: Stahle, Susan
Subject: FW: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Wednesday, November 13, 2013 3:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

When: Wednesday, November 13, 2013 3:00 PM-3:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

Note: The GMT offset above does not reflect daylight saving time adjustments.

~~*~*~*~*~*~*~*~*

Sue,

You should have gotten this invitation. Please let me know if you didn't

-----Original Appointment-----
From: Echols, Mabel E. [mailto:Mabel_E._Echols@omb.eop.gov]
Sent: Friday, September 27, 2013 1:15 PM
To: Echols, Mabel E.; Mancini, Dominic J.; Laity, Jim; Higgins, Cortney; Schwab, Margo; Finken, Anne; Birchfield, Norm; Li, Jia; Bruce_D_Rodan@ostp.eop.gov; Rosnick, Reid; Schultheisz, Daniel
Cc: Stahle, Susan; Perrin, Alan; Edwards, Jonathan
Subject: E.O. 12866 Meeting on National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings
When: Wednesday, November 13, 2013 3:00 PM-3:30 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Room 10103 New Executive Office Building

This meeting was requested by Katie Sweeney, National Mining Association.

EPA-2938

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Addresses for Consultation Letter on Subpart W.msg

- FW Addresses for Consultation Letter on Subpart W.msg

From: Rosnick, Reid
Sent: Thursday, May 15, 2014 7:58 AM
To: Angelique Diaz
Subject: FW: Addresses for Consultation Letter on Subpart W
Importance: High

Angelique,

This is the spreadsheet showing the tribes we sent the letters to. This is a list generated by our tribal office and is also used by NRC for their uranium recovery facilities.

Reid

From: Colon, Toni
Sent: Thursday, May 08, 2014 9:29 AM
To: Cherepy, Andrea
Cc: Harrison, Jed; Peake, Tom; Rosnick, Reid; Edwards, Jonathan; Perrin, Alan
Subject: Addresses for Consultation Letter on Subpart W
Importance: High

Attached is a spreadsheet with tribal leaders and addresses for the consultation letters. You should check the list since I usually use the formal names of the tribes. If you need additional tribes let me know asap today as I will not be in the office tomorrow and will be at the National Tribal Forum all next week.

Several things to note:

1. Canocito was renamed to Tohajiilee Indian Reservation....which is a chapter of the Navajo Nation. Therefore, the letter should go to the Navajo Nation. I don't have an address for the Tohajiilee.
2. Eastern Shoshoni is part of the Wind River Reservation which is part of the Northwestern Band of the Shoshoni. The letter should go to the Northwestern Band of the Shoshoni....chairman, Jason Walker (see attached spreadsheet).
3. Laura McKelvey said that we should also include the Confederated Tribes and Bands of the Yakama Nation (added).
4. Could not find Lakota Sioux.....if you give me the formal name under the BIA's Federally Recognized Tribes then I can give you the address......

Toni Colón
OAQPS Tribal Consultation Advisor (TCA)
Community & Tribal Programs Group,
Office of Air Quality Planning & Standards,

Office of Air & Radiation,
U.S. Environmental Protection Agency
Tel: (919) 541-0069/**Fax:** (919) 541-0942
OAR Tribal Air Website
Alone we can do so little; together we can do so much. —Helen Keller

Firstname & Middle Initia	Lastname	Suffix	Title
Donnie Donald	Cabaniss	Jr.	Chairman
Jim	Shakespear		Chairman
A.T. "Rusty"	Stafne		Chairman
Willie A.	Sharp	Jr.	Chairman
Bill John	Baker		Principal Chief
Janice	Boswell		Governor
Kevin	Keckler Sr		Chairman
Bruce	Sunchild		Chairman
Wallace	Coffey		Chairman
Joe	Durglo		Chairman
Harry	Smiskin		Chairman
Brandon	Sazue		Chairman
Darrin	Old Coyote		Chairman
Anthony	Reider		President
Tracy	King		President
LeRoy	Shingoitewa		Chairman
Wilfred	Whatoname	Sr.	Chairman
Ron	Twohatchet		Chairman
Gordon	Thayer		Chairman
Michael	Jandreau		Chairman
Shannon	Blue		Tribal President
Mark	Chino		President
Ben	Shelly		President
Leroy	Spang		President
Jason	Walker		Chairman
John	Steele		President
Marshall	Gover		President
Rebecca	White	Jr.	Chairperson
Randal	Vicente		Governor
Frank E.	Lujan		Governor
Michael	Toledo	Jr.	Governor
Richard B.	Luarkie		Governor
Malcolm	Montoya		Governor
Rodger	Martinez		President
Cyril L.	Scott		President
Roger	Trudell		Chairman

Ivan D.	Posey		Chairman
Nathan	Small		Chairman
Robert	Shepherd	Sr.	Chairman
Roger	Yankton		Chairman
Charles W.	Murphy		Chairman
Michael	Burgess		Chairman
Ron	Sparkman		Chief
Tex	Hall		Chairman
Merle	St. Clair		Chairman
Gary	Hayes		Chairman
Thurman	Cournoyer		Chairman
Thomas	Beauty		Chairman
Ernest	Jones	Sr.	President
Arlen	Quetawki	Sr.	Governor

Organization	Street	City
Apache Tribe of Oklahoma	PO Box 1220	Anadarko
Arapaho Tribe of the Wind River Reservation	PO Box 396	Fort Washakie
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	PO Box 1027	Poplar
Blackfeet Tribe of the Blackfeet Indian Reservation of Montana	PO Box 850, All Chiefs Square	Browning
Cherokee Nation of Oklahoma	PO Box 948	Tahlequah
Cheyenne and Arapaho Tribes of Oklahoma	PO Box 38	Concho
Cheyenne River Sioux Tribe	PO Box 590	Eagle Butte
Chippewa-Cree Indians of the Rocky Boy's Reservation, Montana	RR1, PO Box 544	Box Elder
Comanche Nation of Oklahoma	PO Box 908	Lawton
Confederated Salish & Kootenai Tribes of the Flathead Rsvn.	Box 278	Pablo
Confederated Tribes and Bands of the Yakama Nation	PO Box 151	Toppenish
Crow Creek Sioux Tribal Council	PO Box 50	Fort Thompson
Crow Tribe of Montana	PO Box 169	Crow Agency
Flandreau Santee Sioux Executive Committee	PO Box 283	Flandreau
Fort Belknap Indian Community of the Fort Belknap Reservation of MT	RR1, Box 66	Harlem
Hopi Tribe of Arizona	PO Box 123	Kykotsmovi
Hualapai Tribal Council	PO Box 179	Peach Springs
Kiowa Indian Tribe of Oklahoma	PO Box 369	Carnegie
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of WI	13394 West Trepania Road	Hayward
Lower Brule Sioux Tribal Council	187 Oyate Circle	Lower Brule
Lower Sioux Indian Community of Minnesota	PO Box 308	Morton
Mescalero Apache Tribe	PO Box 227	Mescalero
Navajo Nation	PO Box 7440	Window Rock
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, I	P.O. Box 128	Lame Deer
Northwestern Band of the Shoshoni Nation	505 Pershing Avenue, Suite 200	Pocatello
Oglala Sioux Tribal Council	PO Box 2070	Pine Ridge
Pawnee Nation of Oklahoma	PO Box 470	Pawnee
Ponca Tribe of Nebraska	PO Box 288	Niobrara
Pueblo of Acoma, New Mexico	PO Box 309	Acoma
Pueblo of Isleta, New Mexico	PO Box 1270	Isleta
Pueblo of Jemez, New Mexico	PO Box 100	Jemez Pueblo
Pueblo of Laguna	PO Box 194	Laguna
Pueblo of Sandia, New Mexico	481 Sandia Loop	Bernalillo
Ramah Navajo Chapter	Route 2, Box 13	Ramah
Rosebud Sioux Tribal Council	PO Box 430	Rosebud
Santee Sioux Nation of Nebraska	108 Spirit Lake Avenue, West	Niobrara

Shoshone Business Community	PO Box 217	Fort Washakie
Shoshone-Bannock Tribes of the Fort Hall Reservation	PO Box 306	Fort Hall
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation	PO Box 509	Agency Village
Spirit Lake Tribal Council	PO Box 359	Fort Totten
Standing Rock Sioux Tribal Council	PO Box D	Fort Yates
The Comanche Nation of Oklahoma	584 NW Bingo Road	Lawton
The Shawnee Tribe	PO Box 189	Miami
Three Affiliated Tribes - MHA Nation	404 Frontage Road	New Town
Turtle Mountain Band of Chippewa	PO Box 900	Belcourt
Ute Mountain Tribe of the Ute Mountain Rsvn, CO, NM & UT	P.O. Box 248	Towaoc
Yankton Sioux Tribe of South Dakota	PO Box 248	Marty
Yavapai-Apache Nation Council	2400 W. Datsi	Camp Verde
Yavapai-Prescott Indian Tribe	530 E Merritt	Prescott
Zuni Tribe of the Zuni Reservation	PO Box 339	Zuni

State	State 2	ZIP
Oklahoma	OK	73005-1330
Wyoming	WY	82514
Montana	MT	59255
Montana	MT	59417
Oklahoma	OK	74465
Oklahoma	OK	73022
South Dakota	SD	57625
Montana	MT	59521
Oklahoma	OK	73502
Montana	MT	59855
Washington	WA	98948-0151
South Dakota	SD	57339
Montana	MT	59022
South Dakota	SD	57028
Montana	MT	59526
Arizona	AZ	86039
Arizona	AZ	86434
Oklahoma	OK	73015
Wisconsin	WI	54843
South Dakota	SD	57548
Minnesota	MN	56270
New Mexico	NM	88340
Arizona	AZ	86515
Montana	MT	59043
Idaho	ID	83201
South Dakota	SD	57770
Oklahoma	OK	74058
Nebraska	NE	68760
New Mexico	NM	87034
New Mexico	NM	87022
New Mexico	NM	87024
New Mexico	NM	87026
New Mexico	NM	87004
New Mexico	NM	87321
South Dakota	SD	57570
Nebraska	NE	68760-7219

Wyoming	WY	82514
Idaho	ID	83203-0306
South Dakota	SD	57262
North Dakota	ND	58335
North Dakota	ND	58538
Oklahoma	OK	73507
Oklahoma	OK	74355
North Dakota	ND	58763-97402
North Dakota	ND	58316
Colorado	CO	81334-0248
South Dakota	SD	57380-1153
Arizona	AZ	86322
Arizona	AZ	86301-2038
New Mexico	NM	87327

EPA-3118

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings.msg

- RE Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings.msg

From: Peake, Tom
Sent: Monday, May 12, 2014 4:05 PM
To: Perrin, Alan
Cc: White, Rick; Ferguson, Rafaela; Rosnick, Reid; Schultheisz, Daniel; Stradford, Virginia; Gillam, Connie
Subject: RE: Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings

Alan,
I spoke with Cathy Molina. She is interested in discussing the Subpart W proposed rule with us and implications it may have for Virginia. Last week I believe we were thinking it may be related to 192, but their interest is the Subpart W proposal.

She seemed OK to meet with Mike Flynn instead of needing to meet with Janet, too as the logistics would be much easier given Janet's schedule. I mentioned that we would need to summarize the discussion for the docket since it would occur during the comment period, so I asked if she could identify the topics of interest ahead of time and she said she would. And she said that they would submit comments later.

I left it that I would have Reid follow-up with her to better understand the topics of interest. In the meantime I will ask Reid to coordinate with Connie/Ginny to schedule a meeting with Mike in the next few weeks.

Reid, please work with Connie to set up a time when at least you and Mike are available for a meeting. Cathy Molina (cmalina@selcva.org, Phone: 434-977-4090) will be the one to coordinate with at the Southern Environmental Law Center.

Tom

From: Perrin, Alan
Sent: Monday, May 12, 2014 3:34 PM
To: Peake, Tom
Cc: White, Rick; Ferguson, Rafaela
Subject: FW: Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings

Tom, where are you with this?

~~~~~~~~~~~~~
Alan Perrin, Deputy Director
Radiation Protection Division, USEPA
office (202) 343-9775 | bb (202) 279-0376

From: Ferguson, Rafaela
Sent: Monday, May 12, 2014 3:23 PM
~~~~~~~~~~~~~

To: White, Rick; Perrin, Alan
Subject: RE: Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings

Rick,

Tom should be working that.

Rafie

From: White, Rick
Sent: Monday, May 12, 2014 3:20 PM
To: Perrin, Alan; Ferguson, Rafaela
Subject: FW: Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings

Hi Guys-
Mike told me that Alan had discussed this group with him following up on the e-mail I sent to you guys last week. Ginny just got a follow up request from them requesting a meeting be set up. Has anone reached out to them yet to see if a meeting (at Mike's level) would even make sense? Let me know.

Thanks.

Rick

From: Stradford, Virginia
Sent: Monday, May 12, 2014 2:38 PM
To: White, Rick
Subject: FW: Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings

Hi Rick,

Here's the follow-up information about this proposed meeting with Mike and Janet.

Thanks.

-Ginny

From: Cathy Malina [mailto:cmalina@selcva.org]
Sent: Monday, May 12, 2014 12:02 PM
To: Stradford, Virginia
Subject: Meeting request concerning National Emission Standards for Radon From Uranium Mill Tailings

Dear Ms. Stradford,

Thank you for speaking with me earlier this morning. As I mentioned on the phone, the Southern Environmental Law Center (SELC) would like to meet with Director Flynn and Assistant Administrator McCabe to discuss the proposed revisions to the National Emission Standards for Radon Emissions from Operating Uranium Mill Tailings. SELC has concerns about the portions of the proposed rule that reference Virginia, particularly in light of the conclusions of the 2012 report by the National Academy of Sciences on uranium mining in Virginia.

Please let me know if Mr. Flynn and Ms. McCabe would be available sometime in the next couple of weeks to meet with Cale Jaffe, the Director of SELC's Virginia Office, and Bob Burnley, the former Director of the Virginia Department of Environmental Quality, who has been working as an outside consultant to SELC on uranium issues.

Thank you very much,

Cathy

Catherine Malina
Associate Attorney
Southern Environmental Law Center
201 West Main St., Suite 14
Charlottesville, VA 22902-5065
Phone: 434-977-4090
Fax: 434-977-1483
www.SouthernEnvironment.org

EPA-3245

Reid Rosnick	To		
	cc		
	bcc		
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W tribal consultation letter & labels.msg	

- Subpart W tribal consultation letter & labels.msg

From: Cherepy, Andrea
Sent: Thursday, May 08, 2014 1:31 PM
To: Gillam, Connie
Cc: Rosnick, Reid
Subject: Subpart W tribal consultation letter & labels

Connie,

Thank you for offering to deal with the labels for the 50 tribal consultation letters. The addresses can be found in the attached Excel spreadsheet. The spreadsheet was set up to assist in using Microsoft's "Mail Merge" feature, which is why you see the addresses tabulated the way they are.

For instructions on using "Mail Merge" to create address labels, please go to:
http://office.microsoft.com/en-us/word-help/mail-merge-for-labels-HA102809780.aspx

I have also attached an electronic version of the letter, just in case any problems come up during signature. I will be out of the office for a few days and don't want to hold up getting these letters mailed.

Thanks again,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

<<AddressBlock>>

<<CorrespondenceBlock>>

On May 2, 2014 the U.S. Environmental Protection Agency proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA’s proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments,
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
    - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at (202) 343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan D. Edwards
Director
Radiation Protection Division

Firstname & Middle Initia	Lastname	Suffix	Title
Donnie Donald	Cabaniss	Jr.	Chairman
Jim	Shakespear		Chairman
A.T. "Rusty"	Stafne		Chairman
Willie A.	Sharp	Jr.	Chairman
Bill John	Baker		Principal Chief
Janice	Boswell		Governor
Kevin	Keckler Sr		Chairman
Bruce	Sunchild		Chairman
Wallace	Coffey		Chairman
Joe	Durglo		Chairman
Harry	Smiskin		Chairman
Brandon	Sazue		Chairman
Darrin	Old Coyote		Chairman
Anthony	Reider		President
Tracy	King		President
LeRoy	Shingoitewa		Chairman
Wilfred	Whatoname	Sr.	Chairman
Ron	Twohatchet		Chairman
Gordon	Thayer		Chairman
Michael	Jandreau		Chairman
Shannon	Blue		Tribal President
Mark	Chino		President
Ben	Shelly		President
Leroy	Spang		President
Jason	Walker		Chairman
John	Steele		President
Marshall	Gover		President
Rebecca	White	Jr.	Chairperson
Randal	Vicente		Governor
Frank E.	Lujan		Governor
Michael	Toledo	Jr.	Governor
Richard B.	Luarkie		Governor
Malcolm	Montoya		Governor
Rodger	Martinez		President
Cyril L.	Scott		President
Roger	Trudell		Chairman

Ivan D.	Posey		Chairman
Nathan	Small		Chairman
Robert	Shepherd	Sr.	Chairman
Roger	Yankton		Chairman
Charles W.	Murphy		Chairman
Michael	Burgess		Chairman
Ron	Sparkman		Chief
Tex	Hall		Chairman
Merle	St. Clair		Chairman
Manuel	Heart		Chairman
Thurman	Cournoyer		Chairman
Thomas	Beauty		Chairman
Ernest	Jones	Sr.	President
Arlen	Quetawki	Sr.	Governor

Organization	Street	City
Apache Tribe of Oklahoma	P.O. Box 1220	Anadarko
Arapaho Tribe of the Wind River Reservation	P.O. Box 396	Fort Washakie
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	P.O. Box 1027	Poplar
Blackfeet Tribe of the Blackfeet Indian Reservation of Montana	P.O. Box 850, All Chiefs Square	Browning
Cherokee Nation of Oklahoma	P.O. Box 948	Tahlequah
Cheyenne and Arapaho Tribes of Oklahoma	P.O. Box 38	Concho
Cheyenne River Sioux Tribe	P.O. Box 590	Eagle Butte
Chippewa-Cree Indians of the Rocky Boy's Reservation, Montana	RR1, P.O. Box 544	Box Elder
Comanche Nation of Oklahoma	P.O. Box 908	Lawton
Confederated Salish & Kootenai Tribes of the Flathead Rsvn.	P.O. Box 278	Pablo
Confederated Tribes and Bands of the Yakama Nation	P.O. Box 151	Toppenish
Crow Creek Sioux Tribal Council	P.O. Box 50	Fort Thompson
Crow Tribe of Montana	P.O. Box 169	Crow Agency
Flandreau Santee Sioux Executive Committee	P.O. Box 283	Flandreau
Fort Belknap Indian Community of the Fort Belknap Reservation of MT	RR1, Box 66	Harlem
Hopi Tribe of Arizona	P.O. Box 123	Kykotsmovi
Hualapai Tribal Council	P.O. Box 179	Peach Springs
Kiowa Indian Tribe of Oklahoma	P.O. Box 369	Carnegie
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin	13394 West Trepania Road	Hayward
Lower Brule Sioux Tribal Council	187 Oyate Circle	Lower Brule
Lower Sioux Indian Community of Minnesota	P.O. Box 308	Morton
Mescalero Apache Tribe	P.O. Box 227	Mescalero
Navajo Nation	P.O. Box 7440	Window Rock
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montar	P.O. Box 128	Lame Deer
Northwestern Band of the Shoshoni Nation	505 Pershing Avenue, Suite 200	Pocatello
Oglala Sioux Tribal Council	P.O. Box 2070	Pine Ridge
Pawnee Nation of Oklahoma	P.O. Box 470	Pawnee
Ponca Tribe of Nebraska	P.O. Box 288	Niobrara
Pueblo of Acoma, New Mexico	P.O. Box 309	Acoma
Pueblo of Isleta, New Mexico	P.O. Box 1270	Isleta
Pueblo of Jemez, New Mexico	P.O. Box 100	Jemez Pueblo
Pueblo of Laguna	P.O. Box 194	Laguna
Pueblo of Sandia, New Mexico	481 Sandia Loop	Bernalillo
Ramah Navajo Chapter	Route 2, Box 13	Ramah
Rosebud Sioux Tribal Council	P.O. Box 430	Rosebud
Santee Sioux Nation of Nebraska	108 Spirit Lake Avenue, West	Niobrara

Shoshone Business Community	P.O. Box 217	Fort Washakie
Shoshone-Bannock Tribes of the Fort Hall Reservation	P.O. Box 306	Fort Hall
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation	P.O. Box 509	Agency Village
Spirit Lake Tribal Council	P.O. Box 359	Fort Totten
Standing Rock Sioux Tribal Council	P.O. Box D	Fort Yates
The Comanche Nation of Oklahoma	584 NW Bingo Road	Lawton
The Shawnee Tribe	P.O. Box 189	Miami
Three Affiliated Tribes - MHA Nation	404 Frontage Road	New Town
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Ute Mountain Tribe of the Ute Mountain Reservation, CO, NM & UT	P.O. Box 248	Towaoc
Yankton Sioux Tribe of South Dakota	P.O. Box 248	Marty
Yavapai-Apache Nation Council	2400 W. Datsi	Camp Verde
Yavapai-Prescott Indian Tribe	530 E Merritt	Prescott
Zuni Tribe of the Zuni Reservation	P.O. Box 339	Zuni

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Montana	MT	59417
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Oklahoma	OK	73022
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Oklahoma	OK	73502
Montana	MT	59855
Washington	WA	98948-0151
South Dakota	SD	57339
Montana	MT	59022
South Dakota	SD	57028
Montana	MT	59526
Arizona	AZ	86039
Arizona	AZ	86434
Oklahoma	OK	73015
Wisconsin	WI	54843
South Dakota	SD	57548
Minnesota	MN	56270
New Mexico	NM	88340
Arizona	AZ	86515
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New Mexico	NM	87034
New Mexico	NM	87022
New Mexico	NM	87024
New Mexico	NM	87026
New Mexico	NM	87004
New Mexico	NM	87321
South Dakota	SD	57570
Nebraska	NE	68760-7219

Wyoming	WY	82514
Idaho	ID	83203-0306
South Dakota	SD	57262
North Dakota	ND	58335
North Dakota	ND	58538
Oklahoma	OK	73507
Oklahoma	OK	74355
North Dakota	ND	58763-97402
North Dakota	ND	58316
Colorado	CO	81334-0248
South Dakota	SD	57380-1153
Arizona	AZ	86322
Arizona	AZ	86301-2038
New Mexico	NM	87327

EPA-2917

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\docket contents.msg

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From: Miller, Beth
Sent: Thursday, May 08, 2014 9:28 AM
To: Rosnick, Reid
Subject: docket contents

 Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

Document Search Results

Docket Id	Document Id	Title	Date Received	Phase	Typ
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0001	National Emission Standards: Radon Emissions from Operating Mill Tailings	05/02/2014	Posted	PROPOSE RULES
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0002	Surface Water Hydrology Considerations in predicting radon releases from water-covered areas of uranium tailings ponds	11/17/2009	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0003	Radon releases from Austrailian uranium mining and millng projects: assessing the UNSCEAR approach	11/17/2009	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0004	Minutes from December 3, 2009 stake holder conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0005	Minutes from January 5, 2010 conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0006	Minutes from April 6, 2010 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0007	Minutes from July 6, 2010 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0008	Minutes from October 5, 2010 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0009	Minutes from January 5, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0010	Minutes from April 7, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0011	Minutes from July 7, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0012	Minutes from October 6, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0013	April 26, 2007 Notice of Intent to sue	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0014	Civil Suit filed against USEPA for failure to review/revise Subpart W in a timely fashion	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0015	History of NESHAPS and Subpart W Report 9/25/2008	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0016	Tailings Impoundment Technologies Report 9/25/2008	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0017	Review of Method 115 Report 9/25/2008	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0018	Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida [EPA-520/5-85-029] January 1986	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0019	Quality Assurance Project Plan (QAPP)	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0020	2009 Settlement Agreement between EPA and Plaintiffs	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0021	Letter to plaintiffs regarding settlement agreement on November 3, 2009	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0022	Work Plan for Risk Assessments	01/05/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0023	Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment for Lincoln Park/Cotter Uranium Mill	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0024	Comments by Steven H. Brown, CHP, SENES Consultants Limited 11/7/2010	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0025	NRC/NMA Uranium Recovery Workshop	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0026	National Mining Association 2008	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0027	Meeting material from presentation in Canon City, Colorado - June 30, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0028	National Mining Association 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0029	Meeting material from presentation in Rapid City, South Dakota - October 1, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0030	Notes from meeting with National Mining Association	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0031	National Mining Association 2010	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0032	NESHAP Subpart W Activities An Internet Webinar - National Webinar	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0033	Tuba City Arizona Uranium Stakeholders	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0034	Uranium Recovery Workshop April 29 - 30, 2008	01/05/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0035	Uranium Recovery Workshop April 29 - 30, 2008	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0036	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0037	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0038	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0039	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0040	National Emission Standards for Hazardous Air Pollutants; Standards for Radionuclides April 6 1983 Proposed Rule	01/06/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0041	Federal Register 40 CFR Part 61 192.32 a	01/06/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0042	October 31, 1984 ANPR Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0043	40 CFR Part 61 General Requirements	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0044	Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings [EPA 520/1-86-009]	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0045	National Emission Standards for Hazardous Air Pollutants (NESHAPs), Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings. September 24, 1986 Final Rule	01/09/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0046	Draft Environmental Impact Statement (EIS) for Proposed NESHAPS for Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0047	March 7, 1989 Proposed Rule, National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0048	Risk Assessment Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (1)	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0049	Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (2)	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0050	Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (3)	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0051	December 15, 1989 Final Rule, National Emission Standards for Hazardous Air Pollutants; Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0052	Method 115-Monitoring for Radon-222 Emissions	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0053	Subpart T Rescission	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0054	40 CFR Part 61 192.32 a Errata	01/09/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0055	40 CFR Part 61 General Requirements Errata	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0056	EPA Procedures for Determining Confidential Business Information	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0057	October 17 2000 Errata	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0058	NRC's In-Situ Leach Facility Standard Review Plan	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0059	IAEA Uranium Mill Tailings Report	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0060	USEPA Contract Number EP-D-05-002	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0061	Letter to Angelique Diaz, USEPA from Frank Filas, Environmental Manager, Energy Fuels Resources Corporation on August 31, 2010	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0062	Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0063	Evaporation Pond Design Report Pinon Ridge Project Montrose County, Colorado	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0064	Letter to Energy Fuels Resources Corporation from Steven H. Brown, SENES Consultants Limited on August 30, 2010	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0065	Raffinate Characterization Pinon Ridge Mill Montrose County, Colorado	01/10/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0066	Section 114 Letters/Responses	01/13/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0067	Comparison of CAP88 calculations from SC&A and the EPA web version of CAP88	01/26/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0068	Sheep Mountain Uranium Project	02/07/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0069	Status of Cell 3 at the White Mesa mill	02/07/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0070	Construction of An Environmental Radon Monitoring System Using CR-39 Nuclear Track Detectors	04/18/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0071	Letter from Kennecott Uranium Company to Mr. Reid Rosnick	05/02/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0072	Surface Water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0073	Uranium Mill Tailings Radon Flux Calculations	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0074	Radon Emissions from Tailings and Evaporation Ponds	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0075	Minutes from January 5, 2012 Conference Call	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0076	Minutes from April 5, 2012 Conference Call	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0077	Colorado Citizens Against Toxic Waste (CCAT) Concerns about Cotter Uranium Mill	05/31/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0078	November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0079	Risk Assessment Model Selection Methodology	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0080	Minutes from July 5, 2012	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0081	Minutes from October 4, 2012	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0082	Minutes from January 3, 2013 conference call	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0083	Minutes from April 3, 2013	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0084	Minutes from July 11, 2013	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0085	Experimental Determination of Radon Fluxes over Water	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0086	Subpart W-EIA-BID	07/30/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0087	Risk Assessment Revision for 40 CFR Part 61 Subpart W â€“	09/12/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0088	Record of Communication, May 16, 2013	09/17/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0089	Subpart W Stakeholders Conference Call of October 17, 2013	10/24/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0090	Subpart W Stakeholders Conference Call of January 2, 2014	01/07/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0091	Meeting presentation to Office of Management and	01/09/2014	Posted	SUPPORT & RELATE MATERIA

		Budget by members of the National Mining Association			
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0092	Subpart W Interagency comments under EOs 12866 and 13563	01/13/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0093	OMB questions on BID EIA	01/13/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0094	E.O. 12866 review - draft	01/13/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0095	Recommended Procedures for Measuring Radon Fluxes from Disposal Sites for Residual Radioactive Materials	02/12/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0096	Subpart W Stakeholders Conference Call	04/22/2014	Posted	SUPPORT & RELATE MATERIA

EPA-2935

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Form Letter for Tribal Consultation.msg

- Form Letter for Tribal Consultation.msg

From: Rosnick, Reid
Sent: Friday, May 02, 2014 9:08 AM
To: Peake, Tom
Subject: Form Letter for Tribal Consultation

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

The Honorable Ben Shelly
President, Navajo Nation
P.O. Box 7440
Window Rock, AZ 86515

Dear President Shelly:

On May 2, 2014the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments,
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
    - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.

- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at 202-343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Steve Etsitty, NNEPA

EPA-2966

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Form Letter for Tribal Consultation.msg

- FW Form Letter for Tribal Consultation.msg

From: Rosnick, Reid
Sent: Wednesday, May 07, 2014 8:43 AM
To: Cherepy, Andrea
Subject: FW: Form Letter for Tribal Consultation

Completed.

From: Peake, Tom
Sent: Wednesday, May 07, 2014 8:41 AM
To: Rosnick, Reid
Subject: RE: Form Letter for Tribal Consultation

Looks good to me. Add a space between 2014 and the.
On May 2, 2014the U.S. Environmental Protection Agency

From: Rosnick, Reid
Sent: Friday, May 02, 2014 9:08 AM
To: Peake, Tom
Subject: Form Letter for Tribal Consultation

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

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Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Steve Etsitty, NNEPA

EPA-3182

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Subpart W and homepage posted .msg

- RE Subpart W and homepage posted .msg

From: Rosnick, Reid
Sent: Friday, May 02, 2014 12:55 PM
To: Miller, Beth
Subject: RE: Subpart W and homepage posted

I can give you the document if you want to link to that.

From: Miller, Beth
Sent: Friday, May 02, 2014 12:54 PM
To: Rosnick, Reid
Subject: RE: Subpart W and homepage posted

Yeah that's what I am trying to find do you have it handy.


Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Friday, May 02, 2014 12:53 PM
To: Miller, Beth
Subject: RE: Subpart W and homepage posted

Beth,

There is no link to the FR notice

From: Miller, Beth
Sent: Friday, May 02, 2014 12:51 PM
To: Nesky, Anthony; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: Subpart W and homepage posted

http://www.epa.gov/radiation/

http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

 Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

FEDERAL REGISTER

Vol. 79 Friday,

No. 85 May 2, 2014

Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

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[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10^{7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for groundwater contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m²/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

EPA-3187

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Subpart W generic tribal consultation letter (4).msg

- RE Subpart W generic tribal consultation letter (4).msg

From: Rosnick, Reid
Sent: Wednesday, May 07, 2014 11:10 AM
To: Cherepy, Andrea
Subject: RE: Subpart W generic tribal consultation letter

Thank you!!

From: Cherepy, Andrea
Sent: Wednesday, May 07, 2014 10:58 AM
To: Colon, Toni
Cc: Harrison, Jed; Peake, Tom; Rosnick, Reid; Edwards, Jonathan; Perrin, Alan
Subject: Subpart W generic tribal consultation letter

Toni,

The Office of Radiation and Indoor Air recently proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule (Subpart W); the proposal was published in the Federal Register on Friday, May 2.

I am writing to you to request your assistance in posting the attached letter to TCOTS and in sending the letter out to the 51 tribes listed below. It's my understanding that you have the ability to use Microsoft's "Mail Merge" feature to automatically address the letter. We would really appreciate your help in this effort.

If it is easier for you to share the file with the address information, we can perform the mail merge here in our office.

Again, thank you for your assistance,
Andrea
(202) 343-9317

Federally-listed tribes to receive the consultation letter on Subpart W:

- Navajo Nation
- Hopi
- Acoma Pueblo
- Laguna
- Cherokee Nation
- Ute Mountain Ute
- Northern Shoshoni
- Oglala Sioux
- Cheyenne River Sioux
- Standing Rock Sioux

- Ponca Tribe of Nebraska
- Flandreau Santee Sioux
- Lower Brule Sioux
- Sisseton-Wahpeton Sioux
- Apache Tribe of Oklahoma
- Blackfeet Tribe
- Cheyenne and Arapaho Tribes
- Yankton Sioux
- Lakota Sioux
- Ramah Navajo
- Zuni Pueblo
- Isleta Pueblo
- Mescalero Apache Tribe
- Sandia Pueblo
- White Mountain Apache Tribe
- Jemez Pueblo
- Tohajiilee
- Canocito
- Yavapai Apache Tribe of Camp Verde
- Yavapai Prescott Indian Tribe
- Hualapai Tribe
- Crow Tribe of Montana
- Chippewa Cree
- Comanche
- Crow Creek Sioux
- Confederated Salish and Kootenai
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- Kiowa Tribe of Oklahoma
- Fort Belknap
- Lower Sioux
- Northern Arapaho
- Northern Cheyenne
- Rosebud Sioux
- Pawnee Nation of Oklahoma
- Santee Sioux Nation
- Shawnee
- Shoshoni-Bannock
- Spirit Lake Tribe
- Turtle Mountain Chippewa
- Three Affiliated Tribes

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

EPA-3188

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Subpart W generic tribal consultation letter.msg

- RE Subpart W generic tribal consultation letter.msg

From: Cherepy, Andrea
Sent: Thursday, May 08, 2014 9:44 AM
To: Colon, Toni
Cc: Rosnick, Reid
Subject: RE: Subpart W generic tribal consultation letter

Toni,

Reid Rosnick is the lead on this action. His phone number is (202) 343-9563.

We will try and mail the letters out tomorrow, May 9.

Thanks again for your help,
Andrea

From: Colon, Toni
Sent: Thursday, May 08, 2014 9:30 AM
To: Cherepy, Andrea
Subject: RE: Subpart W generic tribal consultation letter

Hi Andrea,

Who is the lead on this action.....I will need to include their name/contact information in TCOTS. Also what date are you planning to mail the letter?

Toni Colón
OAQPS Tribal Consultation Advisor (TCA)
Community & Tribal Programs Group,
Office of Air Quality Planning & Standards,
Office of Air & Radiation,
U.S. Environmental Protection Agency
Tel: (919) 541-0069/**Fax:** (919) 541-0942
OAR Tribal Air Website
Alone we can do so little; together we can do so much. —Helen Keller

From: Cherepy, Andrea
Sent: Wednesday, May 07, 2014 10:58 AM
To: Colon, Toni
Cc: Harrison, Jed; Peake, Tom; Rosnick, Reid; Edwards, Jonathan; Perrin, Alan
Subject: Subpart W generic tribal consultation letter

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(202) 343-9317

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- Rosebud Sioux
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- Santee Sioux Nation
- Shawnee
- Shoshoni-Bannock
- Spirit Lake Tribe
- Turtle Mountain Chippewa
- Three Affiliated Tribes

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

EPA-3235

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W generic tribal consultation letter.msg

- Subpart W generic tribal consultation letter.msg

From: Cherepy, Andrea
Sent: Wednesday, May 07, 2014 10:58 AM
To: Colon, Toni
Cc: Harrison, Jed; Peake, Tom; Rosnick, Reid; Edwards, Jonathan; Perrin, Alan
Subject: Subpart W generic tribal consultation letter

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Andrea
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- Turtle Mountain Chippewa
- Three Affiliated Tribes

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

<<AddressBlock>>

Dear Tribal Leader:

On May 2, 2014 the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
  - conventional tailings impoundments,
  - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
  - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
  - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
  - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
  - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at 202-343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

/s/ Jonathan Edwards, Director
Radiation Protection Division

EPA-3238

Reid Rosnick	To		
	cc		
	bcc		
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W NPRM (5).msg	

- Subpart W NPRM (5).msg

From: Rosnick, Reid
Sent: Friday, May 02, 2014 7:24 AM
To: Stahle, Susan
Subject: Subpart W NPRM

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

FEDERAL REGISTER

Vol. 79 Friday,
No. 85 May 2, 2014

Part III

Environmental Protection Agency

40 CFR Part 61
Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

• *www.regulations.gov*: Follow the on-line instructions for submitting comments.

• *Email: a-and-r-docket@epa.gov.*

• *Fax:* 202–566–9744.

• *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.

• *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html*.

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m²/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ⁷ cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m²/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m²/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m²/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m²/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 $pCi/m^2/sec$.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

EPA-2936

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

- FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

From: Stephanie Washington [mailto:Washington.Stephanie@epamail.epa.gov]
Sent: Tuesday, April 29, 2014 11:18 AM
To: Rosnick, Reid; Brooks, Patricia
Subject: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

Your document is about to publish in the Federal Register. This publication date has been confirmed with the Office of the Federal Register.
Title: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review
FRL #: 9816-2
Docket #: EPA-HQ-OAR-2008-0218
Published Date: 05/02/2014

EPA-2967

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR (8).msg

- FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR (8).msg

From: Rosnick, Reid
Sent: Wednesday, April 30, 2014 6:21 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Valentine Anoma; Walker, Stuart; Zhen, Davis; Angelique Diaz; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

FYI,

A heads-up that the NESHAP Subpart W proposed rule will be published in the FR this Friday.

Reid

From: Stephanie Washington [mailto:Washington.Stephanie@epamail.epa.gov]
Sent: Tuesday, April 29, 2014 11:18 AM
To: Rosnick, Reid; Brooks, Patricia
Subject: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

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FRL #: 9816-2
Docket #: EPA-HQ-OAR-2008-0218
Published Date: 05/02/2014

EPA-2968

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR (9).msg

- FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR (9).msg

From: Rosnick, Reid
Sent: Wednesday, April 30, 2014 6:19 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel; Lee, Raymond; Herrenbruck, Glenna; Nesky, Anthony; Ferguson, Rafaela
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

FYI,

I'll notify the Regions/Workgroup in a separate email.

Reid

From: Stephanie Washington [mailto:Washington.Stephanie@epamail.epa.gov]
Sent: Tuesday, April 29, 2014 11:18 AM
To: Rosnick, Reid; Brooks, Patricia
Subject: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

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FRL #: 9816-2
Docket #: EPA-HQ-OAR-2008-0218
Published Date: 05/02/2014

EPA-2969

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

- FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

From: Rosnick, Reid
Sent: Wednesday, April 30, 2014 10:16 AM
To: Miller, Beth
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

Beth,

Looks like we're going to need the docket to live on Friday.

From: Stephanie Washington [mailto:Washington.Stephanie@epamail.epa.gov]
Sent: Tuesday, April 29, 2014 11:18 AM
To: Rosnick, Reid; Brooks, Patricia
Subject: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

Your document is about to publish in the Federal Register. This publication date has been confirmed with the Office of the Federal Register.
Title: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review
FRL #: 9816-2
Docket #: EPA-HQ-OAR-2008-0218
Published Date: 05/02/2014

EPA-3093

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

- RE FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

From: Rosnick, Reid
Sent: Wednesday, April 30, 2014 12:05 PM
To: Miller, Beth
Subject: RE: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.

Not at this time

From: Miller, Beth
Sent: Wednesday, April 30, 2014 12:04 PM
To: Rosnick, Reid
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.

WE don't plan on adding anything else is that correct?

From: Akram, Assem
Sent: Wednesday, April 30, 2014 11:03 AM
To: Miller, Beth
Subject: RE: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.

Hi, Beth –
Thanks for the heads up. At this time you have 95 entries in FDMS that are ready to be posted with the FR.
Are you planning on adding any new docs?
Thanks
Assem

>>>>>>**>>><<<**<<<<<<
Assem Akram
Docket Manager
USEPA Docket Center
Operated by ASRC Primus
(202) 566-0226
akram.assem@epa.gov

From: Miller, Beth
Sent: Wednesday, April 30, 2014 10:50 AM
To: Akram, Assem
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

From: Rosnick, Reid
Sent: Wednesday, April 30, 2014 10:16 AM
To: Miller, Beth
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.

Beth,

Looks like we're going to need the docket to live on Friday.

From: Stephanie Washington [mailto:Washington.Stephanie@epamail.epa.gov]
Sent: Tuesday, April 29, 2014 11:18 AM
To: Rosnick, Reid; Brooks, Patricia
Subject: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

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Title: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review
FRL #: 9816-2
Docket #: EPA-HQ-OAR-2008-0218
Published Date: 05/02/2014

EPA-3239

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W NPRM (6).msg

- Subpart W NPRM (6).msg

From: Rosnick, Reid
Sent: Friday, May 02, 2014 7:02 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Herrenbruck, Glenna
Cc: Schultheisz, Daniel; Nesky, Anthony; Miller, Beth; Ferguson, Rafaela
Subject: Subpart W NPRM

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

FEDERAL REGISTER

Vol. 79 Friday,

No. 85 May 2, 2014

Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m²/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ⁷ cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m²/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles			2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture			0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m²/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

EPA-3253

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Updates for Subpart W page for Friday.msg

- Updates for Subpart W page for Friday.msg

From: Nesky, Anthony
Sent: Wednesday, April 30, 2014 2:12 PM
To: Miller, Beth
Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: Updates for Subpart W page for Friday

Dear Beth:

As you know, Subpart W will be published in the Federal Register on Friday. Please see the attached Word document for revisions to the webpage, which we want to post as soon as we hear that Subpart W has appeared in the Federal Register.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Subpart W Rulemaking Activity

NESHAP Subpart W is a radon emission standard for operating uranium mill tailings. In accordance with the Clean Air Act Amendments of 1990, EPA formed a workgroup to review the standard.

EPA will provide up-to-date information on recent or upcoming conference calls, resources, public hearings and contact information. Please check back regularly, as more items will be added.

Get e-mail updates when this information changes.

EPA is proposing revisions to Subpart W. Comments due on 07/31/2014

EPA has released a Notice of Proposed Rulemaking that would revise "National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. Comments must be received in writing by___

In addition, EPA will conduct a hearing where members of the public may provide testimony or verbal comments. Please check back regularly; details and instructions will be added to this page as soon as they are available.

Top of page

Download the Proposed Rule and Submit Comments on Line

- Notice of Proposed Rulemaking from the Federal Register.
- Fact Sheet on the Proposed Rule (2 pp, 52 K, About PDF)
- Submit Comments on line at Regulations.gov (Note: Comments may also be submitted by mail, see the Notice of Proposed Rulemaking for instructions)

Note: Continue he rest of the Subpart W page as-is, starting with "Conference Call Information".

UPDATE TO THE RPD HOME PAGE--

Regulations Under Review

- New! National Emission Standards for Hazardous Air Pollutants (NESHAPs)-Radon from Operating Uranium Mill Tailings EPA has released a Notice of Proposed Rulemaking that would revise "National Emission Standards for Radon Emissions from Operating Mill Tailings," Subpart W of 40 CFR Part 61. The public is invited to submit comments on the proposed rulemaking. Comments must be received in writing by___

EPA-3250

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\tribal consultation letter.msg

- tribal consultation letter.msg

From: Cherepy, Andrea
Sent: Wednesday, April 23, 2014 11:48 AM
To: Harrison, Jed
Cc: Rosnick, Reid
Subject: tribal consultation letter

Jed,

The Subpart W proposal has been signed and will be published in the Federal Register any day now. Reid Rosnick has prepared a tribal consultation letter that closely follows the examples provided in the Tribal Consultation Handbook. Jon Edwards has asked that we run the letter by you before it gets sent out.

Can you please review the attached letter and provide any comments to both Reid and me (I'll be out of the office on Thurs. and Fri.)?

Thank you,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

Manuel Heart, Chairman
Ute Mountain Ute Tribe
P.O. Box 6
Towaoc, CO 81334

Dear Chairman Heart:

On ***DATE***, the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
  - conventional tailings impoundments,
  - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
  - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
  - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
  - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
  - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.

- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about ***DATE***. A public hearing will be held in Denver, Colorado on ***DATE***. If you wish to initiate government to government consultations with the EPA on this rule, please contact __________------. Please contact us by______in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Tribal Environmental Director
Tribal Environmental Staff

EPA-2899

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Addition.msg

- Addition.msg

From: Rosnick, Reid
Sent: Tuesday, April 22, 2014 10:41 AM
To: Miller, Beth
Subject: Addition

Hi again, Beth,

I have another favor. Will you please post the attachment on the Subpart W website? Post it at the bottom of the Current Action section and call it: **Background Information Document and Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking.** Thanks, I think this is it for today ☺

Reid

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills
(40 CFR 61.250)

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
February 2014

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ACRONYMS AND ABBREVIATIONS

ACE	Army Corps of Engineers
AEA	Atomic Energy Act
AIRDOS	AIR DOSe
ALARA	as low as reasonably achievable
AMC	American Mining Congress
ANPR	Advance Notice of Proposed Rulemaking
$BaCl_2$	barium chloride
BEIR	Biological Effects of Ionizing Radiation
BID	background information document
CAA	Clean Air Act
CAP88	Clean Air Act Assessment-1988
CFR	*Code of Federal Regulations*
CHP	certified health physicist
Ci/yr	curies per year
cm	centimeter
cm/sec	centimeter per second
cm^2/sec	square centimeter per second
CPI	consumer price index
CPP	Central Processing Plant
DARTAB	Dose And Risk TABulation
DOE	Department of Energy
EDF	Environmental Defense Fund
EIA	Energy Information Administration
EIS	environmental impact statement
EPA	Environmental Protection Agency
E-PERM	Electric Passive Environmental Radon Monitor
FGR	Federal Guidance Report
FR	*Federal Register*
ft	feet
g/cc	gram per cubic centimeter
G&A	general and administrative

GACT	generally available control technology
GCL	geosynthetic clay liner
GHG	Greenhouse Gas
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HRTM	Human Respiratory Tract Model
ICRP	International Commission on Radiological Protection
in/yr	inches per year
ISL	in-situ leach
ISR	in-situ recovery
km	kilometer
L	liter
LAACC	large-area activated charcoal collector
lb	pound
LCF	latent cancer fatalities
L/d	liters per day
LLDPE	linear low-density polyethylene
LoC	line of credit
m^2	square meters
m^3/hr	cubic meters per hour
m/sec	meters per second
MACT	maximum achievable control technology
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mi	mile
MIR	maximum individual risk
mph	miles per hour
mrem	millirem
mSv	millisievert
N.C.	not calculated
NESHAP	National Emission Standard for Hazardous Air Pollutants

N.G.	not given
NMA	National Mining Association
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
O&M	operation and maintenance
ORISE	Oak Ridge Institute for Science and Education
pCi	picocurie
pCi/(ft^2-sec)	picocurie per square foot per second
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/(m^2-sec)	picocurie per square meter per second
PIPS	passive implanted planar silicon
POO	Plan of Operation
PVC	polyvinyl chloride
R&D	research and development
Ra	radium
RADRISK	RADiation RISK
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent in man
RMEI	reasonably maximally exposed individual
Rn	radon
RSO	radiation safety officer
SC	Sierra Club
SF	square foot
tpd	tons per day
U	uranium
U_3O_8	triuranium octoxide
UMTRCA	Uranium Mill Tailings Remedial Control Act
WCS	Waste Control Specialists, LLC
WL	working level
WLM	working level month
ZnS(Ag)	silver doped zinc sulfide

1.0 EXECUTIVE SUMMARY

The purpose of this report is to present the reader with an understanding of the facilities being regulated under this National Emission Standard for Hazardous Air Pollutant (NESHAP). The report also presents the technical bases that the Environmental Protection Agency (EPA or the Agency) has used for evaluating the risks from existing facilities and for determining that the prescribed work practice standards represent generally available control technology (GACT), as required by section 112(d) of the 1990 amendments to the Clean Air Act (CAA).

The Agency is also defining the scope of its review of the Subpart W NESHAP to include the waste impoundments at in-situ leach (ISL) uranium recovery facilities and heap leach recovery operations, since all post-1989 impoundments, which potentially contain uranium byproducts, are considered to be under the NESHAP. The Agency has defined the scope of the review to include regulation of the heap leach pile, as it believes the pile contains byproduct material during operations.

1.1 Introduction, History, and Basis

After a brief introduction, this report describes the events that led the Agency to promulgate a NESHAP for radon emissions from operating uranium mill tailings on December 15, 1989, in Section 40 of the *Code of Federal Regulations* (40 CFR) Part 61, Subpart W. The 1977 amendments to the CAA include the requirement that the Administrator of EPA determines whether radionuclides should be regulated under the act. In December 1979, the Agency published its determination in the *Federal Register* (FR) that radionuclides constitute a hazardous air pollutant (HAP) within the meaning of section 112(a)(1). In 1979, the Agency also developed a background information document (BID) to characterize "source categories" of facilities that emit radionuclides into ambient air, and in 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID. On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings, establishing an emission standard of 20 picocuries per square meter per second (pCi/(m^2-sec)) for radon (Rn)-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. Between 1984 and 1986, the Environmental Defense Fund (EDF), the Natural Resources Defense Council (NRDC), the Sierra Club (SC), and the American Mining Congress (AMC) filed various court petitions seeking modifications to the NESHAPs.

In a separate decision, the U.S. District Court for the District of Columbia outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk, and then considering additional factors, such as costs to establish the "ample margin of safety."

Section 112(q)(1) of the 1990 CAA Amendments requires that certain emission standards shall be reviewed, and if appropriate, revised to comply with the requirements of section 112(d). Subpart W is under review/revision in response to that requirement. Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. In accordance with section 112(d), the Administrator has

elected to promulgate standards that provide for the use of GACT or management practices to regulate radon emissions from uranium recovery facility tailings impoundments noted in Subpart W.

1.2 The Uranium Extraction Industry Today

From 1960 to the mid-1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. In the early years, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. Because of overproduction, the price of uranium rapidly declined in the 1980s. The declining uranium market could not support the existing number of uranium recovery operations, and many of the uranium recovery facilities in the United States were closed, decommissioned, and reclaimed. In the mid- to late 1980s, several uranium recovery projects employing the solution, or ISL, mining process came on line. However, because of a need for clean energy, a need to develop domestic sources of energy, and other reasons, current forecasts predict growth in the U.S. uranium recovery industry over the next decade and continuing into the future.

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. Representative of the extent of the conventional uranium milling operations that currently exist and are licensed in the United States are the mills at Sweetwater, Wyoming; Shootaring Canyon, Utah; and White Mesa, Utah. Only the White Mesa mill is currently in operation. A conventional mill at Piñon Ridge, Colorado, is currently in the planning and licensing stage. Additionally, a total of six potentially new conventional mill facilities are being discussed in New Mexico, Wyoming, Utah, and Arizona.

The radon data for the conventional mill tailings impoundments indicate that the radon exhalation rates from the surfaces are generally within the Subpart W standard of 20 pCi/(m^2-sec), but occasionally the standard may be exceeded. When that occurs, the tailings are usually covered with more soil, and the radon flux is reduced.

Solution, or ISL, mining is defined as the leaching or recovery of uranium from the host rock by chemicals, followed by recovery of uranium at the surface. ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects in the 1980s demonstrated solution mining to be a viable uranium recovery technique. Ten ISL facilities are currently operating (see Table 8, page 33), and about 23 other facilities are restarting, expanding, or planning for new operations.

Uranium is leached into solution through the injection into the ore body of a lixiviant. A lixiviant is a chemical solution used to selectively extract (or leach) uranium from ore bodies where they are normally found underground. The injection of a lixiviant essentially reverses the geochemical reactions that are associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. The liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. Since radium (Ra)-226 is present in the liquid bled from the lixiviant, radon will be generated in and released from the ISL's evaporation/holding ponds/ impoundments. The amount of radon released from these evaporation/holding ponds has been estimated and found to be small. (See Section 3.3.1.)

Heap leaching is a process by which chemicals are used to extract the economic element (for the purposes of Subpart W, uranium) from the ore. A large area of land is leveled with a small gradient, and a liner and collection system are installed. Ore is extracted from a nearby surface or underground mine and placed in heaps atop the liner. A leaching agent (usually an acid) will then be sprayed on the ore. As the leaching agent percolates through the heap, the uranium is mobilized and enters the solution. The solution will flow to the bottom of the pile and then along the gradient into collecting pools, from which it will be pumped to an onsite processing plant. In the past, a few commercial heap leach facilities operated but none is now operating. Planning and engineering have been undertaken for two heap leach facilities, one in Wyoming and the other in New Mexico.

A brief review of Method 115, "Monitoring for Radon-222 Emissions" (40 CFR 61, Appendix B) (SC&A 2008), demonstrated that its use can still be considered current for monitoring radon flux from conventional uranium tailings impoundments. It is not an option for measuring radon emissions from evaporation or holding ponds because there is no solid surface on which to place the monitors.

1.3 Current Understanding of Radon Risk

A description of how the understanding of the risk presented by radon and its progeny has evolved since the 1989 BID was published examines three parameters: (1) the radon progeny equilibrium fraction, (2) the epidemiological risk coefficients, and (3) the dosimetric risk coefficients. Additionally, SC&A (2011) used the computer code CAP88 version 3.0 (Clean Air Act Assessment Package-1988) to analyze the radon risk from eight operating uranium recovery sites, plus two generic sites.

The lifetime (i.e., 70-year) maximum individual risk (MIR)[1] calculated using data from eight actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments, while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments. (SC&A 2011)

To protect public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to a lifetime MIR of approximately 1 in 10 thousand (i.e., 10^{-4}). Although the calculated high end of the lifetime MIR range is above 10^{-4}, there are several mitigating factors. First, the highest MIR was calculated for a hypothetical mill at an eastern generic site. If an actual mill were to be located at the Eastern Generic site, it would be required to reduce its radon

[1] In this BID all risks are presented as mortality risks. If it is desired to estimate the morbidity risk, simply multiply the mortality risk by 1.39.

emissions as part of its licensing commitments. Also, the assumptions that radon releases occur continuously for 70 years and that the same reasonably maximally exposed individual (RMEI) is exposed to those releases for the entire 70 years are very conservative.

Likewise, the risk assessment estimated that the risk to the population from all eight real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 kilometers (km) of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km (50 miles) was 0.0043, which was less than one case every 200 years, for existing impoundments and 0.014, or approximately one case every 70 years, for new impoundments.

1.4 Evaluation of Subpart W Requirements

EPA has determined that radon releases from uranium recovery facilities are HAPs, as defined by the CAA. Furthermore, no radionuclide (including radon) releases have met the CAA's definition of major sources, and thus radon releases from uranium recovery facilities are classified as area sources. (See Section 5.3.) Under section 112(d) of the CAA, the EPA Administrator may elect to promulgate standards or requirements applicable to area sources that provide for the use of GACTs or management practices to reduce emissions of HAPs. For the four source categories of radon releases from uranium recovery facilities, the Administrator has elected to promulgate GACTs as follows:

Conventional Impoundments – Constructed on or before December 15, 1989

GACT The flux standard of 20 pCi/(m^2-sec) contained in the current 40 CFR 61.252(a) will no longer be required; require that these conventional impoundments be operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Conventional Impoundments – Constructed after December 15, 1989

GACT Retain the standard that conventional impoundments be designed, constructed, and operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Nonconventional Impoundments – Where uranium byproduct material (i.e., tailings) are contained in ponds and covered by liquids

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restrictions, and require that during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

Heap Leach Piles

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), and require that the moisture content of the operating heap be maintained at or greater than 30 percent.

Additionally, the analyses provided in this BID support the following findings:

- Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.
- By requiring that conventional impoundments be designed, constructed, and operated to meet one of two 40 CFR 61.252(b) work practices (i.e., phased disposal and continuous disposal), adoption of an emission limit (e.g., 20 pCi/(m^2-sec)) is not necessary to protect public health.
- The requirement that conventional impoundments use either phased or continuous disposal technologies is appropriate to ensure that public health is protected with an ample margin of safety, and is consistent with section 112(d) of the 1990 CAA Amendments that require standards based on GACT.
- The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures/facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

1.5 Economic Impacts

The economic impact analysis to support any potential revision of the Subpart W NESHAP is presented in four distinct areas:

(1) A review and summary of the original 1989 economic assessment and supporting documents are provided.

(2) The baseline economic costs for development of new conventional mills, ISL facilities, and heap leach facilities are developed and presented.

(3) The anticipated costs to the industries versus the environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

(4) Finally, information is provided on the economic impacts to disadvantaged and tribal populations and on environmental justice.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For conventional mills, data from the proposed new mill at the Piñon Ridge project in Colorado were used. Data from two proposed new ISL facilities were used; the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14 to 15-year production period,

which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Table 1 summarizes the unit cost (dollars per pound) estimates for all four uranium recovery facilities. As shown, on a unit cost basis, heap leach facilities are projected to be the least expensive, and the two ISL facilities the most expensive.

Table 1: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC	w/o LoC
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87

Because the four proposed GACTs are not expected to change the manner in which any of the uranium recovery facilities are designed, built, or operated, no additional economic benefits or costs are associated with the proposed Subpart W revisions.

At 10 of the 15 existing or proposed uranium recovery sites analyzed, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is white exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either African-American or Other is less than the national norm, while the percentage of African-Americans and Others is less than the regional norm at all but one site. The analysis found that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are more economically advantaged (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the United States' 50th percentile. On the other hand, five sites are located in areas where the per capita nonfarm wealth is below the country's 10th percentile.

2.0 INTRODUCTION, HISTORY, AND BASIS

On December 15, 1989, EPA promulgated a NESHAP for radon emissions from operating uranium mill tailings (40 CFR 61, Subpart W). Section 112(q) of the CAA, as amended, requires EPA to review, and if appropriate, revise or update the Subpart W standard on a timely basis (within 10 years of passage of the CAA Amendments of 1990). Soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically. However, recent developments in the market for uranium have led to some companies expressing their intention to pursue licensing of new facilities, and therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations before these proposed facilities become operational.

Two separate standards are defined in Subpart W. The first states that existing sources (facilities constructed before December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) or 1.9 picocuries per square foot per second (pCi/(ft^2-sec)) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA showing the results of the compliance monitoring. The second Subpart W standard prescribes that for new sources (facilities constructed on or after December 15, 1989), no new tailings impoundment can be built unless it is designed, constructed, and operated to meet one of the two following work practices:

(1) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) as determined by the U.S. Nuclear Regulatory Commission (NRC). The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

(2) Continuous disposal of tailings such that tailings are dewatered and immediately disposed of with no more than 10 acres uncovered at any time and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The work practice standard also applies to operations at existing sources, once their existing impoundments can no longer accept additional tailings.

The facilities covered by Subpart W are uranium recovery facilities, also licensed and regulated by the NRC or its Agreement States. The NRC becomes involved in uranium recovery operations once the ore is processed and chemically altered. This occurs either in a uranium mill (the next step from a conventional mine) or during ISL or heap leach. For this reason, the NRC regulates ISL facilities, as well as uranium mills and the disposal of liquid and solid wastes from uranium recovery operations (including mill tailings), but does not regulate the conventional uranium mining process. The NRC regulations for the protection of the public and workers from exposure to radioactive materials are found in 10 CFR 20, while specific requirements for the design and operation of uranium mills and disposition of tailings are found in 10 CFR 40, Appendix A.

2.1 Document Contents and Structure

This report is divided into six sections. The first two sections are the Executive Summary and this introduction, which includes discussions of the history of the development of Subpart W (Section 2.2) and the basis for the 1989 risk assessments (Section 2.3). Four technical sections, the contents of which are summarized below, follow this introductory section.

2.1.1 The Uranium Extraction Industry Today

After a brief history of the uranium market, Section 3.0 identifies both the uranium recovery facilities that are licensed today and those that have been proposed to be built in the future.

For currently existing impoundments, Section 3.0 presents the following information:

- Data on the configuration of current impoundments.
- Results of compliance monitoring.

Section 3.0 also presents a description of the Method 115 radon monitoring method.

2.1.2 Current Understanding of Radon Risk

Section 4.0 presents a qualitative analysis of the changes that have occurred in the understanding of the risks associated with Rn-222 releases from impoundments. Emphasis is on the changes to the predicted radon progeny equilibrium fractions and the epidemiological and dosimetric lifetime fatal cancer risk per working level (WL). Section 4.0 also discusses how the current analytical computer model, CAP88 Version 3.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Finally, Section 4.4 presents dose and risk estimates for several current uranium recovery facilities.

2.1.3 Evaluation of Subpart W

The evaluation of Subpart W requirements required the analyses of some key issues to determine if the current technology has advanced since the 1989 promulgation of the rule. The key issues include: existing and proposed uranium recovery facilities, Resource Conservation and Recovery Act (RCRA) comparison, regulatory history, tailings impoundment technologies, radon measurement methods, and risk assessment. Section 5.0 discusses these key issues, in order to determine whether the requirements of Subpart W are necessary and sufficient.

Based on the evaluation of the key issues and in keeping with section 112(d) of the CAA, Section 5.0 also presents GACT radon emission control standards for three categories of uranium recovery facilities:

(1) Conventional impoundments.

(2) Nonconventional impoundments, where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids.

(3) Heap leach piles.

In addition to the key issues, several issues that need clarification in order to be more fully understood are presented and described. The issues in need of clarification include extending monitoring requirements, defining when the closure period for an operating facility begins, interpretation of the term “standby,” the role of weather events, and monitoring reporting requirements.

2.1.4 Economic Impact Analysis

Section 6.0 of the document reviews and reassesses all the additional economic impacts that may occur due to the extension and revision of the Subpart W NESHAP and specifically addresses the following:

- A review and summary of the original 1989 economic assessment and supporting documents are provided.

- The baseline economic costs for the development of new conventional mills and ISL and heap leach facilities are developed and presented.

- The anticipated costs to industries versus environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

- Finally, information is provided relating to economic impacts on disadvantaged populations and tribal populations and to environmental justice.

2.2 History of the Development of the Subpart W NESHAP

The following subsections present a brief history of the development of environmental radiation protection standards by EPA, with particular emphasis on the development of radionuclide NESHAPs.

Table 2 presents a partial time line sequence of EPA's radiation standards with emphasis on the NESHAPs, including Subpart W.

Table 2: Partial Timeline of EPA's Radiation Standards

January 13, 1977	EPA publishes 40 CFR 190 – Environmental Protection Standards for Nuclear Power Operations.
August 1979	EPA publishes first BID, *Radiological Impacts Caused by Emission of Radionuclides into Air in the United States*, EPA 520/7-79-006.
December 27, 1979	EPA determines radionuclides constitute a HAP – (section 112(a)(1) amendments to the CAA.
January 5, 1983	EPA under UMTRCA promulgates, 40 CFR 192, Subpart B "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites," that for inactive tailings or after closure of active tailings, the radon flux should not exceed an average release rate of 20 pCi/(m^2-sec).
March 1983	EPA publishes draft report, *Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-83-001, and proposes radionuclide NESHAPs for: 1. DOE and Non-NRC-Licensed Federal Facilities. 2. NRC-Licensed Facilities. 3. Elemental Phosphorus Plants. 4. Underground Uranium Mines.
September 30, 1983	EPA issues standards under UMTRCA (40 CFR 192, Subparts D and E) for the management of tailings at locations licensed by the NRC or the States under Title II of the UMTRCA. These standards do not specifically limit Rn-222 emissions until after closure of a facility; however, they require ALARA procedures for Rn-222 control.
February 17, 1984	SC sues EPA (District Court for Northern California) and demands EPA promulgate final NESHAP rules for radionuclides or find that they do not constitute a HAP (i.e., "de-list"" the pollutant). In August 1984, the court grants the SC motion and orders EPA to take final actions on radionuclides by October 23, 1984.
October 22, 1984	EPA issues *Final Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-84-022-1and -2.
October 23, 1984	EPA withdraws the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities.

Table 2: Partial Timeline of EPA's Radiation Standards

December 1984	District Court finds EPA in contempt. EPA and SC submit motion to court with schedule (August 5, 1985). Court orders EPA to issue final standards for Rn-222 emissions from licensed uranium mills and mill tailings impoundments by May 1, 1986 (later moved to August 15, 1986).
February 6, 1985, to September 24, 1986	EPA promulgates NESHAPs for: 1. DOE Facilities (February 1985). 2. NRC-Licensed Facilities and Non-DOE Federal Facilities (February 1985). 3. Elemental Phosphorus Plants (February 1985). 4. On April 17, 1985, Rn-222 emissions from underground uranium mines added. 5. On September 24, 1986, Rn-222 from licensed uranium mill tailings added – 20 pCi/(m^2-sec) and the work practice standard for small impoundments or continuous disposal.
November 1986	AMC and EDF file petitions challenging the NESHAPs for operating uranium mills.
July 28, 1987	The Court of Appeals for the District of Columbia remanded to EPA the NESHAP for vinyl chloride (see text). Given the decision, EPA petitioned the court for a voluntary remand of standards and asked that the pending litigation on all issues relating to its radionuclide NESHAPs be placed in abeyance during the rulemaking. EPA also agreed to reexamine all issues raised by parties to the litigation. The court granted EPA's petition on December 8, 1987.
September 14, 1989	EPA promulgates NESHAPs for benzene, etc. Importantly, EPA establishes the "fuzzy bright line." That is, EPA's approach to residual risk under section 112 (as advanced in the Hazardous Organic NESHAPs and approved by the District of Columbia Circuit in *NRDC v. EPA*) as essentially establishing a "fuzzy bright line" with respect to carcinogens, whereby EPA must eliminate risks above one hundred in one million (1 in 10,000) , does not have to address risks below one in one million (1 in 1,000,000), and has discretion to set a residual risk standard somewhere in between (Jackson 2009). In a second step, EPA can consider whether providing the public with "an ample margin of safety" requires risks to be reduced further than this "safe" level, based on EPA's consideration of health information and other factors such as cost, economic impact, and technological feasibility (Jackson 2009).
September 1989	EPA publishes the NESHAPs for radionuclides. The agency prepared an EIS in support of the rulemaking. The EIS consisted of three volumes: Volume I, *Risk Assessment Methodology*; Volume II, *Risk Assessments*; and Volume III, *Economic Assessment.*
December 15, 1989	EPA promulgates NESHAPs for: • Subpart B: National Emission Standards for Radon Emissions from Underground Uranium Mines. • Subpart H: Emissions of Radionuclides Other than Radon from DOE Facilities. • Subpart I: National Emissions of Radionuclides Other than Radon from DOE Facilities by NRC and Federal Facilities Not Covered by Subpart H. • Subpart K: Radionuclide Emissions from Elemental Phosphorus Plants. • Subpart Q: Radon Emissions from DOE Facilities. • Subpart R: Radon Emissions from Phosphogypsum Stacks. • Subpart T: Radon Emissions from the Disposal of Uranium Mill Tailings. (rescinded effective June 29, 1994; published in the FR July 15, 1994). • Subpart W: Radon Emissions from Operating Uranium Mill Tailings Piles.
November 15, 1990	President signs the CAA Amendments of 1990. Part of the act requires that some regulations passed before 1990 be reviewed and, if appropriate, revised within 10 years of the date of enactment of the CAA Amendments of 1990. The amendments also instituted a technology-based framework for HAPs. Sources that are defined as large emitters are to employ MACT, while sources that emit lesser quantities may be controlled using GACT.

2.2.1 The 1977 Amendments to the Clean Air Act

On January 13, 1977 (FR 1977), EPA established environmental protection standards for nuclear power operations pursuant to its authority under the Atomic Energy Act (AEA). The standards in 40 CFR 190, which covered all licensed facilities that are part of the uranium fuel cycle, established an annual limit on exposure to members of the public. The NRC or its Agreement States, which licenses these facilities, has the responsibility for the enforcement of the Part 190 standards. Additionally, the NRC imposes the requirement that licensees keep all exposures "as low as reasonably achievable" (ALARA). The Part 190 standards exempted Rn-222 from the annual limit because of the uncertainties associated with the risk of inhaled radon.

After the promulgation of 40 CFR 190, the 1977 amendments to the CAA were passed. These amendments included the requirement that the Administrator of EPA determine whether radionuclides should be regulated under the CAA.

In December 1979, the Agency published its determination in the *Federal Register* (FR 1979) that radionuclides constitute a HAP within the meaning of section 112(a)(1). As stated in the FR, radionuclides are known to cause cancer and genetic defects and to contribute to air pollution that may be anticipated to result in an increase in mortalities or an increase in serious, irreversible, or incapacitating reversible illnesses. The Agency further determined that the risks posed by emissions of radionuclides into the ambient air warranted regulation and listed radionuclides as a HAP under section 112.

Section 112(b)(1)(B) of the CAA requires the Administrator to establish NESHAPs at a "level which (in the judgment of the Administrator) provides an ample margin of safety to protect the public health" or find that they are not hazardous and delist them.

2.2.2 Regulatory Activities between 1979 and 1987

To support the development of radionuclide NESHAPs, the Agency developed a BID to characterize "source categories" of facilities that emit radionuclides into ambient air (EPA 1979). For each source category, EPA developed information needed to characterize the exposure of the public. This included characterization of the facilities in the source category (numbers, locations, proximity of nearby individuals); radiological source terms (curies/year (Ci/yr)) by radionuclide, solubility class, and particle size; release point data (stack height, volumetric flow, area size); and effluent controls (type, efficiency). Doses to nearby individuals and regional populations caused by releases from either actual or model facilities were estimated using computer codes (see Section 2.3).

In 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID (EPA 1983). These four source categories were the Department of Energy (DOE) and non-NRC-licensed federal facilities, NRC-licensed facilities, elemental phosphorus plants, and underground uranium mines. For all other source categories considered in the BID (i.e., coal-fired boilers, the phosphate industry and other extraction industries, uranium fuel-cycle facilities, uranium mill tailings, high-level waste disposal, and low-energy accelerators), the Agency found that NESHAPs were not necessary. In reaching this conclusion, the Agency found that either the levels of radionuclide emissions did not cause a significant dose to nearby

individuals or the regional populations, the additional effluent controls were not cost effective, or the existing regulations under other authorities were sufficient to keep emissions at an acceptable level.

During the public comment period on the proposed NESHAPs, the Agency completed its rulemaking efforts under the Uranium Mill Tailings Remedial Control Act (UMTRCA) to establish standards (40 CFR 192) for the disposal of uranium mill tailings. With respect to the emission of Rn-222, the UMTRCA standards established a design standard calling for an Rn-222 flux rate of no more than 20 pCi/(m^2-sec).

In February 1984, the SC sued EPA in the U.S. District Court for Northern California (*Sierra Club v. Ruckelshaus*, No. 84-0656) (EPA 1989), demanding that the Agency promulgate final NESHAPs or delist radionuclides as a HAP. The court sided with the plaintiffs and ordered EPA to promulgate final regulations. In October 1984, EPA withdrew the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities, finding that existing control practices protected the public health with an ample margin of safety (FR 1984). EPA also withdrew the NESHAP for underground uranium mines, but stated its intention to promulgate a different standard and published an Advance Notice of Proposed Rulemaking (ANPR) to solicit additional information on control methods. It also published an ANPR for licensed uranium mills. Finally, the FR notice affirmed the decision not to regulate the other source categories identified in the proposed rule, with the exception that EPA was doing further studies of phosphogypsum stacks to see if a standard was needed.

In December 1984, the U.S. District Court for Northern California found EPA's action of withdrawing the NESHAPs to be in contempt of the court's order. Given the ruling, the Agency issued the final BID (EPA 1984) and promulgated final standards for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities in February 1985 (FR 1985a), and a work practice standard for underground uranium mines in April of the same year (FR 1985b).

The EDF, the NRDC, and the SC filed court petitions seeking review of the October 1984 final decision not to regulate the source categories identified above, the February 1985 NESHAPs, and the April 1985 NESHAP. The AMC also filed a petition seeking judicial review of the NESHAP for underground uranium mines.

On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings (FR September 24, 1986), which established an emission standard of 20 pCi/(m^2-sec) for Rn-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. One justifications for the work practices was that, while large impoundments did not pose an unacceptable risk during active operations, the cyclical nature of the uranium milling industry could lead to prolonged periods of plant standby and the risk that the tailings impoundments could experience significant drying, with a resulting increase in Rn-222 emissions. Furthermore, the Agency believed that the two acceptable work practices actually saved the industry from the significant costs of constructing and closing large impoundments before they were completely filled. With the promulgation of the NESHAP for operating uranium mill tailings, three EPA regulations covered the releases of radionuclides into

the air during operations and tailings disposal at uranium mills: 40 CFR 190; 40 CFR 192; and 40 CFR 61, Subpart W.

In November 1986, the AMC and the EDF filed petitions challenging the NESHAP for operating uranium mill tailings.

2.2.3 Regulatory Activities between 1987 and 1989

While the petitions filed by the EDF, NRDC, SC, and AMC were still before the courts, the U.S. District Court for the District of Columbia, in *NRDC v. EPA* (FR 1989b), found that the Administrator had impermissibly considered costs and technological feasibility in promulgating the NESHAP for vinyl chloride. The court outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk and then considering additional factors, such as costs, to establish the "ample margin of safety." Given the court's decision, the Agency reviewed how it had conducted all of its NESHAP rulemakings and requested that the court grant it a voluntary remand for its radionuclide NESHAPs. As part of an agreement with the court and the NRDC, the Agency agreed to reconsider all issues that were currently being litigated, and it agreed that it would explicitly consider the need for a NESHAP for two additional source categories: radon from phosphogypsum stacks and radon from DOE facilities. The subsequent reconsideration became known as the radionuclide NESHAPs reconsideration rulemaking.

2.2.4 1989 Radionuclide NESHAPs Reconsideration Rulemaking

In the radionuclide NESHAPs reconsideration rulemaking, the Administrator relied on a "bright line" approach for determining whether a source category required a NESHAP. This meant that no NESHAP was required if all individuals exposed to the radionuclide emissions from the facilities in the source category were at a lifetime cancer risk of less than 1 in 1,000,000, and less than 1 fatal cancer per year was estimated to be incurred in the population. For source categories that did not meet this "bright line" exclusion, the Agency adopted a two-step, multi-factor approach to setting the emission standards.

The first step established a presumptively acceptable emissions level corresponding to an MIR of about 1 in 10,000 lifetime cancer risk, with the vast majority of exposed individuals at a lifetime risk lower than 1 in 1,000,000, and with less than 1 total fatal cancer per year in the exposed population. If the baseline emissions from a source category met these criteria, they were presumed adequately safe. If they did not meet these criteria, then the Administrator was compelled by his nondiscretionary duty to determine an emission limit that would correspond to risks that were adequately safe.

After baseline emissions were determined to be adequately safe or an adequately safe alternative limit defined, the analysis moved to the second step, where reduced risks for alternative emission limits were evaluated, along with the technological feasibility and costs estimated to be associated with reaching lower levels. In the two-step approach, the Administrator retained the discretion to decide whether the NESHAP should be set at these lower limits.

2.2.5 1990 Amendments to the Clean Air Act

NESHAP Subpart W is under consideration for revision because section 112(q)(1) requires that certain emission standards in effect before the date of enactment of the 1990 CAA Amendments shall be reviewed and, if appropriate, revised to comply with the requirements of section 112(d). As stated previously, soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically, negating the need to perform the Subpart W review. However, as discussed in Section 3.1, recent developments in the market for uranium have led to forecasts of growth in the uranium market over the next decade and continuing for the foreseeable future. Therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations at this time, before facilities developed in response to those forecasts become operational.

Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. Section 112(c) lists radionuclides, including radon, as an HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for the regulation of emissions of HAPs.

The regulation of HAPs at major sources is dictated by the use of maximum achievable control technology (MACT). Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating an MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

EPA has determined that radon emissions from uranium recovery facility tailings impoundments are an area source and that GACT applies (see Section 5.3). The Senate report on the legislation (U.S. Senate 1989) contains additional information on GACT and describes GACT as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.*

Determining what constitutes a GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. It is also necessary to consider the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are considered to determine whether such technologies and practices could be generally available for the area source category at issue. Finally, as noted above, in determining GACTs for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

2.3 Basis for the Subpart W 1989 Risk Assessment and Results

In the 1989 NESHAP for operating uranium mill tailings, exposures and risks were estimated using a combination of actual site data for existing impoundments and model or representative facilities for future impoundments and computer models. The 1989 risk assessment reflected the estimated risks to the regional (0-80 km [0-50 mile]) populations associated with the 11 conventional mills that were operating or in standby[2] at that time. Mathematical models were developed to simulate the transport of radon released from the mill tailings impoundments and the exposures and risks to individuals and populations living near the mills. Those models were programmed into three computer programs for the 1989 risk assessment: AIRDOS-EPA, RADRISK, and DARTAB. The paragraphs that follow briefly discuss each of these computer programs.

AIRDOS-EPA was used to calculate radionuclide concentrations in the air, rates of deposition on the ground, concentrations on the ground, and the amounts of radionuclides taken into the body via the inhalation of air and ingestion of meat, milk, and vegetables. A Gaussian plume model was used to predict the atmospheric dispersion of radionuclides released from multiple stacks or area sources. The amounts of radionuclides that are inhaled were calculated from the predicted air concentrations and a user-specified breathing rate. The amounts of radionuclides in the meat, milk, and vegetables that people ingest were calculated by coupling the atmospheric transport models with models that predict the concentration in the terrestrial food chain.

RADRISK computed dose rates to organs resulting from a given quantity of radionuclide that is ingested or inhaled. Those dose rates were then used to calculate the risk of fatal cancers in an exposed cohort of 100,000 persons. All persons in the cohort were assumed to be born at the same time and to be at risk of dying from competing causes (including natural background radiation). RADRISK tabulated estimates of potential health risk due to exposure to a known quantity of approximately 500 different radionuclides and stored these estimates until needed. These risks were summarized in terms of the probability of premature death for a member of the cohort due to a given quantity of each radionuclide that is ingested or inhaled.

DARTAB provided estimates of the impact of radionuclide emissions from a specific facility by combining the information on the amounts of radionuclides that were ingested or inhaled (as provided by AIRDOS-EPA) with dosimetric and health effects data for a given quantity of each radionuclide (as provided by RADRISK). The DARTAB code calculated dose and risk for individuals at user-selected locations and for the population within an 80-km radius of the source. Radiation doses and risks could be broken down by radionuclide, exposure pathway, and organ.

Of the 11 conventional mills that were operating or in standby at that time, seven had unlined impoundments (the impoundments were clay lined, but not equipped with synthetic liners), while five had impoundments with synthetic liners. As the NESHAP revoked the exemption to the liner requirement of 40 CFR 192.32(a), the mills with unlined impoundments had to close the

[2] "Standby" means the period of time when a facility may not be accepting new tailings but has not yet entered closure operations.

impoundments and move towards final reclamation and long-term stabilization of the tailings impoundments.

2.3.1 Existing Impoundments

The NESHAP for operating uranium mill tailings addressed both existing and future tailings impoundments. For the existing impoundments, the radon emissions and estimated risks were developed using site-specific data for each of the 11 mills that were operating or in standby at the time the assessment was made. These data included the average Ra-226 content of the tailings, the overall dimensions and areas of the impoundments (developed from licensing data and aerial photographs), areas of dry (unsaturated) tailings, the existing populations within 5 km of the centers of the impoundments (identified by field enumeration), 5–80 km populations derived from U.S. Census tract data, meteorological data (joint frequency distributions) from nearby weather stations, mixing heights, and annual precipitation rates.

The AIRDOS-EPA code was used to estimate airborne concentrations based on the calculated Rn-222 source term for each facility. Rn-222 source terms were estimated on the assumption that an Rn-222 flux of 1 pCi/(m^2-sec) results for each 1 picocurie per gram (pCi/g) of Ra-226 in the tailings and the areas of dried tailings at each site. The radon flux rate of 1 pCi/(m^2-sec) per pCi/g Ra-226 was derived based on theoretical radon diffusion equations and on the lack of available radon emissions measurements.

For each sector in the 0–80 km grid around each facility, the estimated Rn-222 airborne concentration was converted to cumulative working level months (WLMs), assuming a 0.50 equilibrium fraction between radon and its decay products, an average respiration rate appropriate for members of the general public, and the assumption of continuous exposure over a 70-year lifetime. Using a risk coefficient of 760 fatalities/10^6 WLM, lifetime risk, fatal cancers per year, and the risk distribution were calculated for the exposed population.

The baseline risk assessment for existing uranium tailings showed an MIR of 3×10^{-5} which was below the benchmark level of approximately 1×10^{-4} and is, therefore, presumptively safe. Additionally, the risk assessment calculated 0.0043 annual fatal cancers in the 2 million persons living within 80 km of the mills. The distribution of the cancer risk showed that 240 persons were at risks between 1×10^{-5} and 1×10^{-4}, and 60,000 were at risks between 1×10^{-6} and 1×10^{-5}. The remainder of the population of about 2 million was at a risk of less than 1×10^{-6}. Based on these findings, EPA concluded that baseline risks were acceptable.

The decision on an ample margin of safety considered all of the risk data presented above plus costs, scientific uncertainty, and the technical feasibility of control technology necessary to lower emissions from operating uranium mill tailings piles. As the risks from existing emissions were very low, EPA determined that an emission standard of 20 pCi/(m^2-sec), which represented current emissions, was all that was necessary to provide an ample margin of safety. The necessity for the standard was explained by the need to ensure that mills continued the current control practice of keeping tailings wet and/or covered. Finally, to ensure that ground water was not adversely affected by continued operation of existing piles that were not synthetically lined

or clay lined, the NESHAP ended the exemption to the requirements of 40 CFR 192.32(a), which protects water supplies from contamination.

2.3.2 New Impoundments

The 1989 risk assessment for new mill tailings impoundments was based on a set of model mills, defined so that the impact of alternative disposal strategies could be evaluated. For the purpose of estimating the risks, the model mills were characterized to reflect operating mills, and the dispersion modeling and population exposures were based on the arid conditions and sparse population density that characterize existing impoundments in the southwestern states.

For new impoundments, a baseline consisting of one large impoundment (116 acres, which is 80% wet or ponded during its 15-year active life) was modeled (i.e., the continuation of the current practice). The baseline results indicated an MIR of 1.6×10^{-4}, a fatal cancer incidence of 0.014 per year, and only 20 persons at a risk greater than 1×10^{-4}. Given the numerous uncertainties in establishing the parameters for the risk assessment and in modeling actual emissions and exposures, the Administrator found that the baseline emissions for new tailings impoundments met the criteria for presumptively safe.

The decision on an ample margin of safety for new tailings considered two alternatives to the baseline of one large impoundment: phased disposal using a series of small impoundments and continuous disposal. The evaluation of these alternatives showed a modest reduction in the MIR and the number of fatal cancers per year, but a significant increase in the number of individuals at a lifetime risk of less than 1×10^{-6}. The costs estimated for the two alternatives showed that phased disposal would lead to an incremental cost of $6.3 million, while continuous disposal was believed to actually result in a modest cost saving of $1 million.

Given the large uncertainties associated with the risk and economic assessments performed for the new tailings impoundments, and considering the boom and bust cycles that the uranium industry has experienced, EPA determined that a work practice standard was necessary to prevent the risks from increasing if an impoundment were allowed to become dry. Finally, although continuous disposal showed slightly lower overall risks and costs than phased disposal, the Administrator recognized that it was not a proven technology for disposal of uranium mills tailings. Therefore, he determined that the work practice standard should allow for either phased disposal (limited to 40-acre impoundments, with a maximum of two impoundments open at any one time) or continuous disposal.

3.0 THE URANIUM EXTRACTION INDUSTRY TODAY: A SUMMARY OF THE EXISTING AND PLANNED URANIUM RECOVERY PROJECTS

Section 3.1 describes the historical uranium market in the United States. In the 1950s and 1960s, the market was dominated by the U.S. government's need for uranium, after which the commercial nuclear power industry began to control the market. The next three sections describe the types of process facilities that were and continue to be used to recover uranium. Section 3.2 describes conventional mills and includes descriptions of several existing mines, while Section 3.3 describes ISL facilities. Heap leach facilities are described in Section 3.4. Finally,

Section 3.5 discusses the applicability of the Subpart W recommended radon flux monitoring method.

3.1 The Uranium Market

The uranium recovery industry in the United States is primarily located in the arid southwest. From 1960 to the mid 1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. The majority of the uranium production at that time was associated with defense needs, while a lesser amount was associated with commercial power reactor needs. Without exception, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. The conventional uranium mining/milling process is described in Section 3.2.

When the demand for uranium could not support the existing number of uranium recovery operations, there was a movement to decommission and reclaim much of the uranium recovery industry in the United States.

The UMTRCA Title I program established a joint federal/state-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet standards set by EPA.

The UMTRCA Title II program is directed toward uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the act provides –

- NRC authority to control radiological and nonradiological hazards.
- EPA authority to set generally applicable standards for both radiological and nonradiological hazards.
- Eventual state or federal ownership of the disposal sites, under general license from NRC.[3]

In the mid- to late 1980s, several commercial uranium recovery projects employing the solution, or ISL, mining process came on line. Section 3.3 describes the uranium ISL mining process. The uranium ISL projects and the data that they collected served as the industry standard. This industry saw an increase in activity as the conventional mine/milling operations were being shut down.

This shift in the method of uranium mining was associated with economic conditions that existed at the time. The price of uranium rapidly declined in the 1980s. The decline in price was associated with overproduction that took place during the earlier years. The peak in production was associated with Cold War production and associated contracts with DOE. However, as the

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[3] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/mill-tailings.html

Cold War came to an end, the need for uranium began to diminish. The amount of uranium that was needed for DOE projects was greatly diminished and, therefore, the price of uranium saw a decline. Figure 1 shows the spot prices for natural uranium. Note the price decline in the early 1980s.

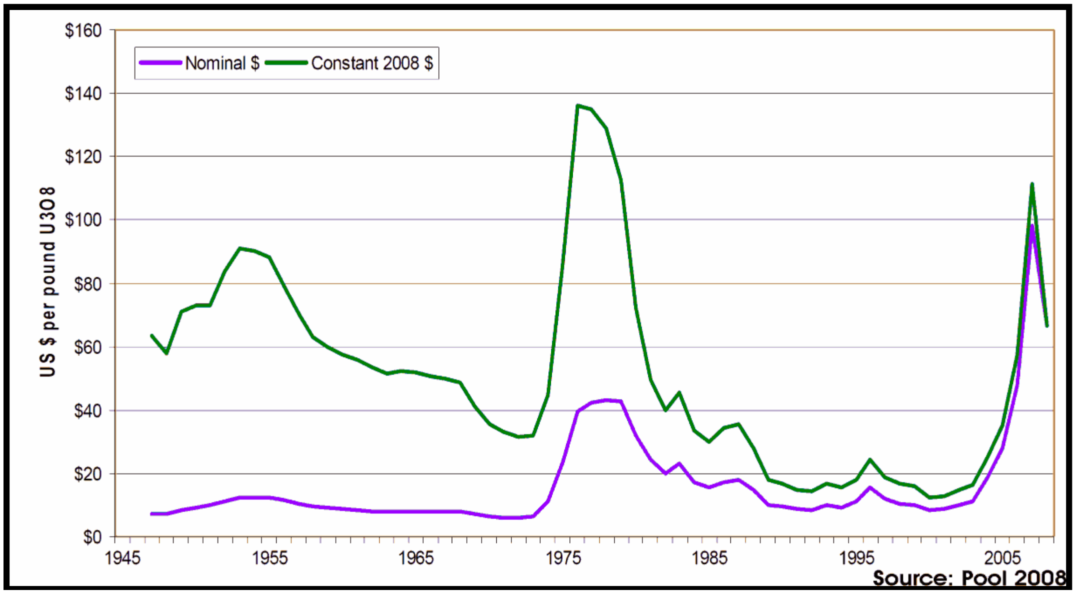
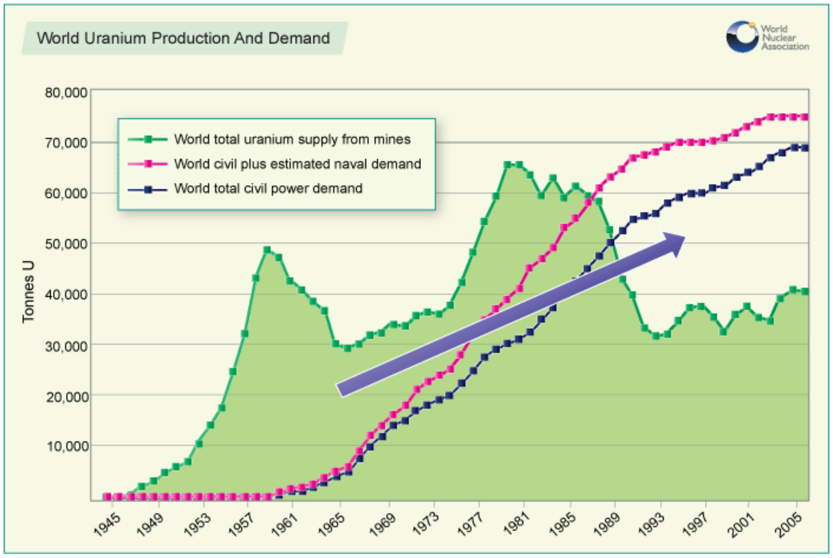


Figure 1: Historical Uranium Prices

Additionally, inexpensive uranium appeared on the worldwide market associated with the foreign supplies of low-grade and rather impure yellowcake. Only minimal purification and associated refinement was necessary to produce a yellowcake feedstock that could supply domestic and worldwide uranium needs from the low-grade foreign supply. Finally, the megatons to megawatts downblending program also supplied large supplies of uranium, both domestically and worldwide. Classical supply and demand economic principles established a market that had oversupply, constant demand and, therefore, a declining price. Consequently, the uranium industry in the United States saw a production decline. Although the number of uranium operations and production of domestic supply of uranium declined, several domestic uranium projects remained active, primarily supplying foreign uranium needs. These projects were generally located in the ISL mining production states of Nebraska, Texas, and Wyoming. This represented a significant shift in the method that was used to recover uranium, from conventional mines to ISL mines.

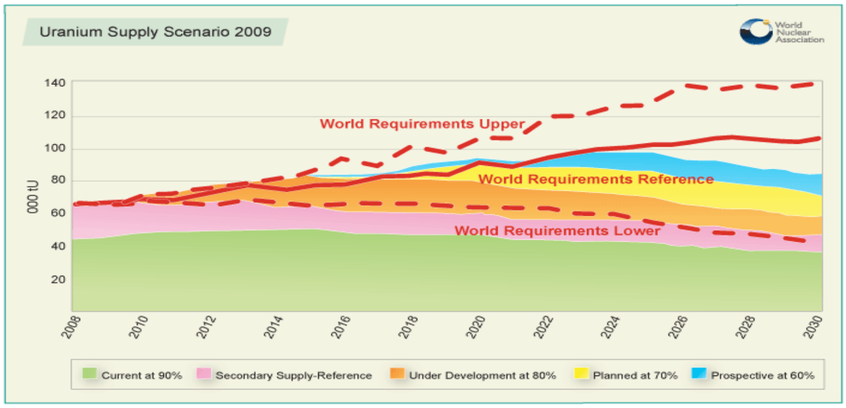
Numerous forecasts of worldwide uranium supply and demand exist. Perhaps one of the best graphical representations is from the World Nuclear Association. Figure 2 shows the actual uranium production rates from 1945 to 2005, as well as the demand trend that was established based on these production numbers. Figure 2 indicates that, from the 1960s to the present, the worldwide uranium demand has continued to increase even though the U.S. price for uranium has decreased.



Source: WNA 2010

Figure 2: Uranium Production and Demand from 1945 to 2005

Figure 3 shows the uranium supply scenario forecast by the World Nuclear Association. The three potential requirement curves shown are based on a variety of factors. The figure indicates that current production, as well as planned future worldwide production, may begin to fall short of demand in the next few years.



Source: WNA 2010

Figure 3: Uranium Supply Scenario from 2008 to 2030

In summary, all forecasts are for the uranium industry to show growth in the next decade and continuing for the foreseeable future. Drivers for this trend are a worldwide need for clean energy resources, the current trend to develop domestic sources of energy, and the investment of foreign capital in the United States, which is recognized as a politically and economically stable market in which to conduct business.

3.2 Conventional Uranium Mining and Milling Operations

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. There are currently no licensed heap leach facilities. Conventional uranium mining and milling operations are in the minority and are a carryover from the heavy production days of the 1970s and 1980s. Sweetwater Mill, Shootaring Canyon Mill, and White Mesa Mill represent the extent of the current conventional uranium milling operations that exist in the United States.

A conventional uranium mill is generally defined as a chemical plant that extracts uranium using the following process:

(1) Trucks deliver uranium ore to the mill, where it is crushed into smaller particles before the uranium is extracted (or leached). In most cases, sulfuric acid (H_2SO_4) is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. In addition to extracting 90–95% of the uranium from the ore, the leaching agent also extracts several other "heavy metal" constituents, including molybdenum, vanadium, selenium, iron, lead, and arsenic.

(2) The mill then concentrates the extracted uranium to produce a material called "yellowcake" because of its yellowish color.

(3) Finally, the yellowcake is transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 4 shows a schematic of a typical conventional uranium mill.

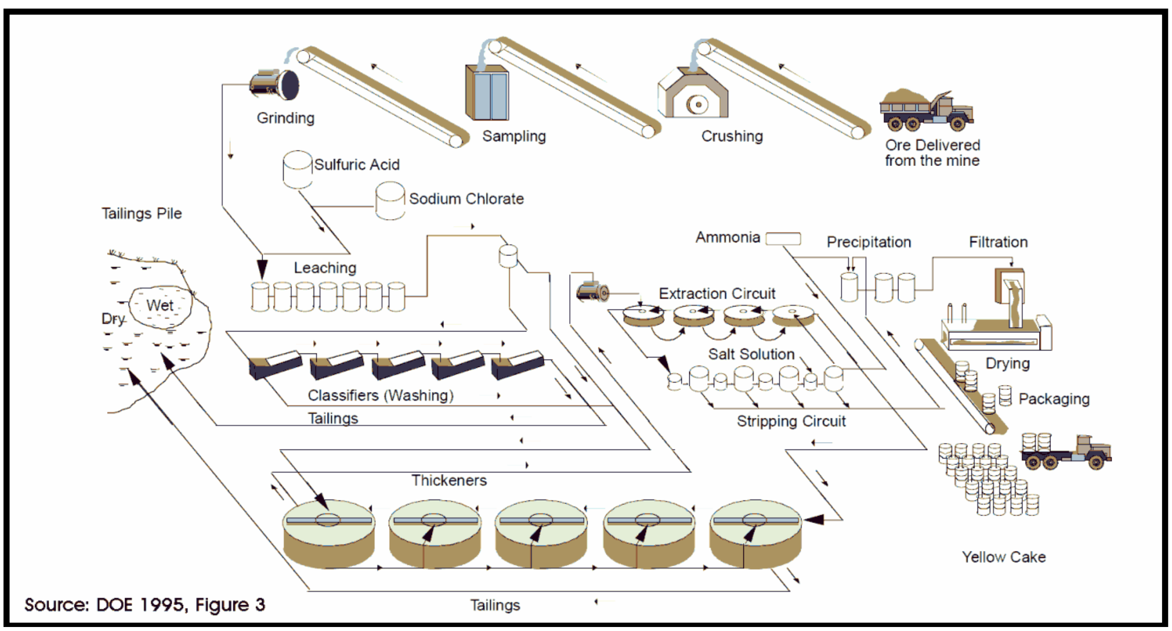


Figure 4: Typical Conventional Uranium Mill

Currently, there are three domestic licensed conventional uranium mining and milling facilities and a newly licensed facility that has yet to be constructed, as shown in Table 3.

Table 3: Conventional Uranium Mining and Milling Operations

Mill Name	Licensee	Location	Website
Sweetwater	Kennecott Uranium Co/Wyoming Coal Resource Co	Sweetwater County, Wyoming	None identified
Shootaring Canyon	Uranium One Americas	Garfield County, Utah	http://www.uranium1.com/indexu.php?section=home
White Mesa	EFR White Mesa LLC	San Juan County, Utah	http://www.energyfuels.com/white_mesa_mill/
Piñon Ridge	Energy Fuels Resources Corp.	Montrose County, Colorado	http://www.energyfuels.com/projects/pinon-ridge/index.html

Mill Name	Regulatory Status	Capacity (tons/day)
Sweetwater	Standby,* license expires November 2014	3,000
Shootaring Canyon	Standby,* license expires May 2012	750
White Mesa	Operating, license expires March 2015	2,000
Piñon Ridge	Development, license issued January 2011	500 (design)

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

Instead of processing uranium ore, the conventional mills shown in Table 3 may process alternate feed stocks. These feed stocks are generally not typical ore, but rather materials that contain recoverable amounts of radionuclides, rare earths, and other strategic metals. These feed stocks are processed, the target materials are recovered, and the waste tailings are discharged to the tailings impoundment. The two facilities shown in Table 3 as being in standby (Sweetwater and Shootaring Canyon) have had their operating licenses converted into "possession only" licenses. Prior to recommencing operation, those facilities will be required to submit a license application to convert back to an operating license. EPA will review that portion of the license application associated with NESHAP to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures.

As described in Section 3.1, the rapid rise in energy costs, increased concerns about global warming, and the tremendous worldwide surge in energy use have all led to renewed interest in uranium as an energy resource. At the spring 2010 joint National Mining Association (NMA)/ NRC Uranium Recovery Workshop, the NRC identified numerous projects that have filed or are expected to file applications for new licenses, expansions of existing operations, or restarts of existing operations, including several proposals for conventional uranium recovery facilities. Contacts with the NRC and state regulatory agencies indicate that permitting and licensing actions are associated with the proposed conventional uranium milling and processing projects shown in Table 4. Although a significant uranium producer, at present, Texas has no interest in conventional uranium milling operations. The potential new mill at Piñon Ridge, Colorado, is not shown in Table 4, since its development is advanced and it has already been listed in Table 3.

Table 4: Proposed New Conventional Uranium Milling Facilities

Company	Site	(Estimated) Application Date	State
Uranium Energy Corp	Anderson Project	N.A.	AZ
Rio Grande Resources	Mt. Taylor	FY14	NM
Strathmore Minerals Corporation	Roca Honda	12-Sep	NM
Uranium Resources, Inc.	Juan Tafoya	FY 14	NM
Oregon Energy, LLC	Aurora Uranium Project	13-Dec	OR
Virginia Uranium	Coles Hills	N.A.	VA
Strathmore Minerals Corporation	Gas Hills	12-Sep	WY

N.A. = not available

No new construction has taken place on any milling facilities shown in Table 4; however, as with all industries, planning precedes construction. Considerable planning is underway for existing and new uranium recovery operations. As with facilities currently in standby, EPA will review the license application to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures for these proposed new mills.

No specific information is available on the type of tailings management systems intended for the proposed new conventional mills. To limit radon that could be emitted from the tailings impoundments, Subpart W requires that the tailings be disposed of in a phased disposal system with disposal cells not larger than 40 acres, or by continuous disposal in which not more than 10 acres of exposed tailings may accumulate at any time. Regardless of the type of tailings management system the new milling operations select, they will all also have to demonstrate that their proposed tailings impoundment systems meet the requirements in 40 CFR 192.32(a)(1).

3.2.1 Sweetwater Mill, Kennecott Mining Company, Red Desert, Wyoming

The Sweetwater project is a conventional uranium recovery facility located about 42 mi northwest of Rawlins, Wyoming, in Sweetwater County. The site is very remote and located in the middle of the Red Desert. The approximately 1,432-acre site includes an ore pad, overburden pile, and the milling area (see Figure 5). The milling area consists of administrative buildings, the uranium mill building, a solvent extraction facility, and a maintenance shop. There is also a 60-acre tailings management area with a 37-acre tailings impoundment that contains approximately 2.5 million tons of tailings material. The Sweetwater impoundments are synthetically lined, as required in 40 CFR 192.32(a). The facility is in a standby status and has a possession only license administered by the NRC. The future plans associated with this facility are unknown, but the facility has been well maintained and is capable of processing uranium. The standby license for this facility is scheduled to expire in 2014. The licensee and/or regulator will decide whether to renew or to terminate this license.

Figure 5: Sweetwater – Aerial View

To demonstrate compliance with Subpart W, testing on the facility's tailings impoundment for radon emissions is conducted annually (KUC 2011). Table 5 shows the results of that testing. The lower flux readings measured in 2009 and 2010 are a direct result of the remediation work (regrading and lagoon construction in the tailings impoundment) performed in 2007 and 2008.

Table 5: Sweetwater Mill Radon Flux Testing Results

Test Date	Radon Flux (pCi/(m^2-sec))	Test Date	Radon Flux (pCi/(m^2-sec))
August 7, 1990	9.0	August 14, 2001	6.98
August 13, 1999	5.1	August 13, 2002	4.10
August 5, 1992	5.6	August 12, 2003	7.11
August 24, 1993	5.0	August 17, 2004	6.38
August 23, 1994	5.0	August 16, 2005	7.63
August 15, 1995	3.59	August 15, 2006	3.37
August 13, 1996	5.47	August 13, 2007	6.01
August 26, 1997	4.23	August 5, 2008	4.59
August 11, 1998	2.66	July 30, 2009	1.60
August 10, 1999	1.27	August 10, 2010	1.44
August 8, 2000	4.05		

Source: KUC 2011, p. 6

Summary of Results

Air monitoring data were reviewed for a 26-year period (1981 to 2007). Upwind Rn-222 measurements, as well as downwind Rn-222 values, were available. The average upwind radon value for the period of record was 3.14 picocuries per liter (pCi/L). The average downwind radon value for the same period was 2.60 pCi/L. These values indicate that there is no measurable contribution to the radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility.

Approximately 28.3 acres of tailings are dry with an earthen cover; the remainder of the tailings is continuously covered with water. The earthen cover is maintained as needed. One hundred radon flux measurements were taken on the exposed tailings, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed beaches was 8.5 pCi/(m^2-sec). The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/(m^2-sec). The calculated radon flux from the entire tailings impoundment surface is approximately 30% of the 20.0 pCi/(m^2-sec) standard.

3.2.2 White Mesa Mill, Energy Fuels Corporation, Blanding, Utah

The White Mesa project is a conventional uranium recovery facility located about 6 mi south of Blanding, Utah, in San Juan County. The approximately 5,415-acre site includes an ore pad, overburden pile, and the milling area (see Figure 6). The mill area occupies approximately 50 acres and consists of administrative buildings, the uranium milling building, and ancillary facilities. The facility used a phased disposal impoundment system, and two of the 40-acre cells are open. The facility has operated intermittently in the past, and this type of operation continues on a limited basis. The amount of milling that takes place, as well as the amount of uranium that is being produced, is a small fraction of the milling capacity. The uranium recovery project has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control.

Figure 6: White Mesa – Aerial View

To demonstrate compliance with Subpart W, the radon flux from tailings surfaces is measured and reported to the State of Utah annually. As Table 6 shows, these data consistently demonstrate that the radon flux from the White Mesa Mill's tailings cells are below the criteria.

Table 6: White Mesa Mill's Annual Radon Flux Testing, Tailings Cells 2 & 3

Year	Radon Flux (pCi/(m^2-sec))	
	Cell 2	**Cell 3**
1997	12.1	16.8
1998	14.3	14.9
1999	13.3	12.2
2000	9.3	10.1
2001	19.4	10.7
2002	19.3	16.3
2003	14.9	13.6
2004	13.9	10.8
2005	7.1	6.2

Source: Denison 2007, p. 116

The Table 6 radon flux values for 2001 and 2002 were elevated when compared to the prior years. Denison believes that these radon fluxes were largely due to the drought conditions in those years, which reduced the moisture content in the interim cover placed over the inactive portions of tailings Cells 2 and 3. In addition, the beginning of the 2002 mill run, which resulted in increased activities on the tailings cells, may have contributed to these higher values. As a result of the higher radon fluxes during 2001 and 2002, additional interim cover was placed on

the inactive portions of Cells 2 and 3. While this effort was successful, additional cover was applied again in 2005 to further reduce the radon flux (Denison 2007).

Summary of Results

Air monitoring data were reviewed for a 2-year period (2006 to 2008). The White Mesa site utilized the MILDOS code to calculate radon concentrations (ANL 1998), in the same calculation process that had been used since 1995. As a comparison, Denison Mines reactivated the six air monitoring stations that were used at the site. Data from these stations were collected for a 2-year period. The upwind and downwind measurements showed no definable trends. At times, the upwind concentrations were the higher values, while at other times, the downwind concentrations were the greatest. However, all values were within regulatory standards.

The tailings facilities at the White Mesa facility consist of the following impoundments/cells (Denison 2011):

- Cell 1, constructed with a 30-millimeter (mil) PVC earthen-covered liner, is used for the evaporation of process solution (Cell 1 was previously referred to as Cell 1-I, but is now referred to as Cell 1).

- Cell 2, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands. Cell 2 has 67 acres of surface area. Because 99% of the cell has a soil cover over the deposited tailings, only 0.7 acres of tailings are exposed as tailings beaches.

- Cell 3, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands and solutions. Cell 3 has 71 acres of surface area, and 54% of the cell has a soil cover over the deposited tailings. The remainder of the cell consists of tailings beaches (19%) and standing liquid (26%).

- Cell 4A, constructed with a geosynthetic clay liner, a 60-mil high-density polyethylene (HDPE) liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in October 2008.

- Cell 4B, constructed with a geosynthetic clay liner, a 60-mil HDPE liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in February 2011.

One hundred radon flux measurements were collected on the Cell 2 beach area, and an additional 100 measurements were taken on the soil-covered area in accordance with Method 115 for Subpart W analysis. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The average radon flux for all of Cell 2 was calculated to be 13.5 pCi/(m^2-sec), or about 68% of the 20.0 pCi/(m^2-sec) standard.

At Cell 3, 100 radon flux measurements were collected from each of the soil cover and the beach areas, as required by Method 115. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The radon flux from the standing liquid-covered area was assumed to be zero. The average radon flux for all of Cell 3 was calculated to be 8.9 pCi/(m^2-sec), or about 46% of the 20.0 pCi/(m^2-sec) standard.

3.2.3 Shootaring Canyon Mill, Uranium One Incorporated, Garfield County, Utah

The Shootaring Canyon project is a conventional uranium recovery facility located about 3 mi north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings management system that is partially constructed (see Figure 7). The mill circuit operated for a very short time and generated only enough tailings to cover 7 acres of the impoundment. Although the milling circuit has been dismantled and sold, the facility is in a standby status and has a possession only license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company. The standby license for this facility is scheduled to expire in 2014. The licensee and/or the regulator will decide whether to renew or to terminate this license.

Figure 7: Shootaring Canyon – Aerial View

Summary of Results

Air monitoring data were reviewed for a 2-year period (2009 to 2010). Continuous air monitoring is not conducted at the site; rather, a 20- to 24-hour sampling event is required once per quarter as a condition of the license. The high-volume air sampler is located downwind of the tailings facility. Many sampling events during a 2-year period indicate that the downwind

Rn-222 concentrations are around 1% of the allowable effluent concentration limit. The two years of data reviewed indicated no trends.

The Shootaring Canyon facility operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in an area of 2,508 m^2 (0.62 acres). The tailings are dry except for moisture-associated occasional precipitation events; consequently, there are no beaches. The tailings have a soil cover that is maintained by the operating company. The impoundment at Shootaring Canyon is synthetically lined, as required in 40 CFR 192.32(a).

One hundred radon flux measurements were collected on the soil-covered tailings area in accordance with Method 115. The 2009 sampling results indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), which exceeded the allowable 20 pCi/(m^2-sec) regulatory limit. In response to this result, the licensee notified the Utah Division of Radiation Control and placed additional soil cover on the tailings. The soil cover consisted of local borrow materials in the amount of 650 cubic yards. More sampling took place during the week of November 7, 2009. An additional 100 sample results were collected and showed that the average radon flux was reduced to 18.1 pCi/(m^2-sec). Sampling for 2010 took place in April. Again, 100 radon flux measurements were collected. The average radon flux revealed by this sampling was 11.9 pCi/(m^2-sec).

3.2.4 Piñon Ridge Mill, Bedrock, Colorado

The Piñon Ridge project is a permitted conventional uranium recovery facility in development. The permitted location is located about 7 mi east of Bedrock, Colorado, and 12 mi west of Naturita, Colorado, in Montrose County (see Figure 8). The approximately 1,000-acre site will include an administration building, a 17-acre mill site, a tailings management area with impoundments totaling approximately 90 acres, a 40-acre evaporation pond with proposed expansion of an additional 40-acre evaporation pond as needed, a 6-acre ore storage area, and numerous access roads. The design of the tailings management area is such that it can meet the work practice standard with a synthetically lined impoundment, a leak detection system, and a surface area that does not exceed 40 acres. The facility has not been constructed, but is fully licensed and administered by the Colorado Department of Public Health and Environment. Also, EPA has approved the facility's license to construct under NESHAP Subpart A of 40 CFR 61. Current activities at the site are maintenance of pre-operational environmental monitoring.

Figure 8: Piñon Ridge – Aerial View

3.2.5 Conventional Mill Tailings Impoundments and Radon Flux Values

In summary, the radon data for the active mill tailings impoundments indicate that the radon exhalation rates from the measured surfaces have exceeded the regulatory standard of 20 pCi/(m^2-sec) at times. Two instances exist in the records that were reviewed. One instance was in 2007, when a portion of the Cotter Corporation impoundment did not have sufficient soil cover. Monitoring results showed a flux rate of 23.4 pCi/(m^2-sec). The tailings surface was covered with a soil mixture, and the flux rate was reduced to 14.0 pCi/(m^2-sec). The second instance in which the regulatory standard was exceeded was recorded during the 2009 sampling event at Shootaring Canyon Mill. This sampling event indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), caused by insufficient soil cover. Although covering tailings piles with various other materials (e.g., synthetics, asphalt, soil-cement mixtures) has been studied, covers made of earth or soil have been shown to be the most cost effective in reducing radon emissions (EPA 1989, NRC 2010). In both cases when monitoring indicated radon fluxes in excess of the standard, additional soil cover was added to the tailings, and the radon flux rates were reduced to below the regulatory standards.

Table 8 shows the average/calculated radon flux values, as reported by the uranium recovery operators.

Table 7: Mill Tailings Impoundments and Average/Calculated Radon Flux Values*

Facility	Radon Flux (pCi/(m^2-sec))		Calculated Tailings Impoundment Average Radon Flux (pCi/(m^2-sec))
	Soil-Covered Area	Tailings Beach	
Sweetwater Mill	No soil-covered area	8.5	6.01
White Mesa Mill, Cell 2	13.1	50.2	13.5
White Mesa Mill, Cell 3	13.9	6.7	8.9
Shootaring Canyon Mill	15 2-year average	Not applicable	15 2-year average
Piñon Ridge Mill	Not applicable	Not applicable	Not applicable

* The respective uranium recovery operators supplied all data and calculations.

3.3 In-Situ Leach Uranium Recovery (Solution Mining)

Solution, ISL or in-situ recovery (ISR), mining is defined as the leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface (IAEA 2005). Leaching, or more correctly the remobilization of uranium into solution, is accomplished through the injection into the ore body of a lixiviant. The injection of a lixiviant essentially reverses the geochemical reactions associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects of the 1980s demonstrated solution mining as a viable uranium recovery technique. Initial efforts at the solution mining process were often less than ideal:

- Lixiviant injection was difficult to control, primarily because of poor well installation.
- Laboratory-scale calculations did not always perform as suspected in geological formations.
- Recovery well spacing was poorly understood, causing mobilized solutions to migrate in unsuspected pathways.
- Restoration efforts were not always effective in re-establishing reducing conditions; therefore, some metals remained in solution and pre-mining ground water conditions were not always achievable.

Additional research and development work indicated that mining solutions could be controlled with careful well installation. The use of reducing agents during restoration greatly decreased the amount of metals that were in solution. As a result of these modifications in mining methods, solution mining of uranium became a viable method to recover some uranium deposits, many of which could not be economically mined by the open pit methods typically employed by the uranium industry. Additionally, the economics of solution mining were more favorable than conventional mining and milling. Because of these factors, solution mining and associated processing began to dominate the uranium recovery industry. Figure 10 shows a schematic of a typical ISL uranium recovery facility.

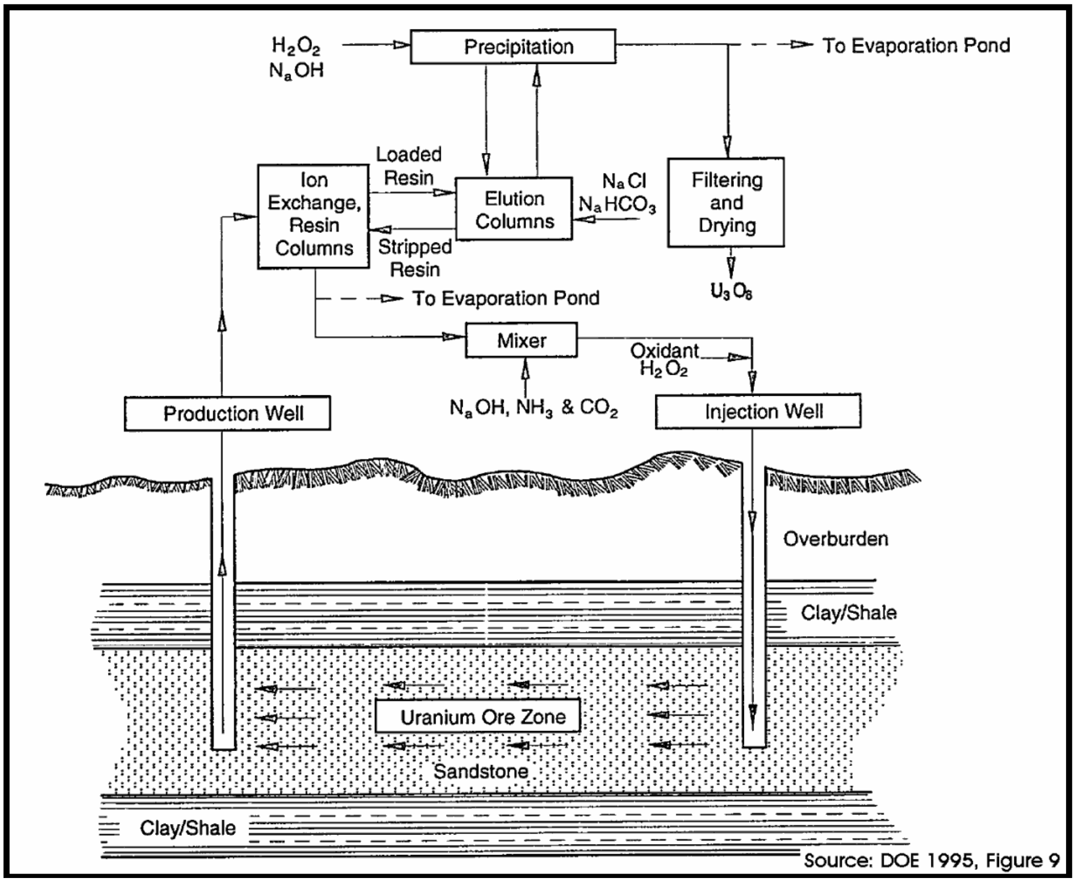


Figure 9: In-Situ Leach Uranium Recovery Flow Diagram

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. As Figure 10 shows, the liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. The pond/impoundment may be used to dispose of the liquid via evaporation, or it may be used simply to hold the liquid until a sufficient amount has been accumulated so that other means may be used to dispose of it (e.g., land application or irrigation, deep well disposal). Since Ra-226 is present in the water bled from the lixiviant, radon will be generated in and released from the solution mining facility's evaporation/holding ponds or impoundments.

The 1989 NESHAP risk assessment (EPA 1989), although not conducted specifically for solution mining sites, is applicable to ponds/impoundments at solution mining facilities. All of the ponds at solution mining facilities are synthetically lined. Because of the presence of liners, none would be required to be closed. The solution mining industry is more transient in that the impoundment life is less than those at conventional uranium mining and milling sites. Typically, the impoundments are in the range of 1–4 acres and are built to state-of-the-art standards.

Two types of lixiviant solutions, loosely defined as acid or alkaline systems, can be used. In the United States, the geology and geochemistry of most uranium ore bodies favor the use of "alkaline" lixiviants or bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of

the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground water restoration. The acid systems once used in the United States are still used in Eastern Europe and Asia and were used recently in Australia on ore bodies in saline aquifers (IAEA 2005).

The four major types of uranium deposits in the United States are: strata-bound (roll front), solution breccia pipe, vein, and phosphatic deposits (EPA 1995). Of these, ISL is the uranium recovery technique used mostly on strata-bound ore deposits. Strata-bound ore deposits are ore deposits contained within a single layer of sedimentary rock. They account for more than 90% of the recoverable uranium and vanadium in the United States and are found in three major geographic areas: the Wyoming Basin (Wyoming and Nebraska), Colorado Plateau or Four Corners area (northwestern New Mexico, western Colorado, eastern Utah, and northeastern Arizona), and southern Texas. A discussion of the origin of the uranium ore, including ore body formation and geochemistry, may be found in the reference, *Technical Resource Document Extraction and Beneficiation of Ores and Minerals*, Volume 5, “Uranium” (EPA 1995). Much of the recoverable uranium in these regions lends itself to ISL because of the physical and geochemical properties of the ore bodies.

Four times a year, the Energy Information Administration (EIA) publishes data on the status of U.S. ISL facilities. EIA (2013) identified six ISL facilities that were recovering uranium and producing yellowcake in the 2nd quarter of 2013. Table 8 shows these facilities. These operations are located in NRC-regulated areas, as well as in Agreement States.

Table 8: Operating ISL Facilities

Plant Owner	Plant Name	County, State
Cameco	Crow Butte Operation	Dawes, Nebraska
Power Resources, Inc. dba Cameco Resources	Smith Ranch-Highland Operation	Converse, Wyoming
Uranium Energy Corp. dba South Texas Mining Venture	Hobson ISR Plant	Karnes, Texas
	La Palangana	Duval, Texas
Mestena Uranium LLC	Alta Mesa Project	Brooks, Texas
Uranium One USA, Inc.	Willow Creek Project (Christensen Ranch and Irigaray)	Campbell and Johnson, Wyoming

The two major geographical areas of ISL mining and processing have been Texas and Wyoming. These areas are well suited to this ISL mining technology, in that the geology associated with the mineralized zone is contained by layers of impervious strata. Texas is the major producer of uranium from ISL operations, followed by Wyoming. ISL operations in South Dakota and Nebraska recover lesser amounts of uranium.

For the 2nd quarter of 2013, EIA (2013) identified the ISL facilities shown in Table 9 as being developed, or partially or fully permitted and licensed, or under construction. As discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining actions.

As the data in Table 9 show, there is considerable interest in ISL mining operations in the U.S. uranium belt. Many of the existing ISL operations are planning for expansion by preparing the license applications and other permitting documents. It is apparent that most domestic uranium recovery will be associated with existing and new ISL operations.

Table 9: ISL Facilities That Are Restarting, Expanding, or Planning for New Operations

Plant Owner	Plant Name	County, State (existing and *planned* locations)	Status, 2nd Quarter 2013
Powertech Uranium Corp	Dewey Burdock Project	*Fall River and Custer, South Dakota*	Developing
Uranium One Americas, Inc.	Jab and Antelope	*Sweetwater, Wyoming*	Developing
Hydro Resources, Inc.	Church Rock	*McKinley, New Mexico*	Partially Permitted And Licensed
Hydro Resources, Inc.	Crownpoint	*McKinley, New Mexico*	Partially Permitted And Licensed
Strata Energy Inc	Ross	*Crook, Wyoming*	Partially Permitted And Licensed
Uranium Energy Corp.	Goliad ISR Uranium Project	*Goliad, Texas*	Permitted And Licensed
Uranium One Americas, Inc.	Moore Ranch	*Campbell, Wyoming*	Permitted And Licensed
Lost Creek ISR, LLC	Lost Creek Project	Sweetwater, Wyoming	Under Construction
Uranerz Energy Corporation	Nichols Ranch ISR Project	Johnson and Campbell, Wyoming	Under Construction

Table 10 shows the size of the surface impoundments at ISL facilities. It is noteworthy that the operation of these facilities does not require impoundments nearly as large as the impoundments used at conventional mills. The impoundments are utilized for the evaporative management of waste water. The impoundments are small because a minimal percentage of the process water needs to be over-recovered to maintain solution flow to the recovery wells. The solution mining industry has used deep well injection for most of the waste water. All signs indicate that this type of waste water disposal will continue in the future.

Table 10 shows that all of the solution mining sites reviewed are using the deep well injection method.

Table 10: ISL Evaporation Pond Data Compilation

Operation	Evaporation pond?	Date pond was constructed	Size of pond	Synthetic liner under pond?	Leak detection system?	Deep well injection?
Cameco, Smith Ranch	East and west ponds	1986	8.6 acres	Yes	Yes, ponds have had leaks	Yes, used for most waste water, started in 1999
Cameco, Crow Butte	3 commercial ponds and 2 R&D ponds	R&D ponds 1990	Pond 1, 2, 5 850×200 ft Pond 3, 4 700×250 ft	Yes	Yes	Yes, all bleed stream
Hydro Resources, Crown Point	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Hydro Resources, Church Rock	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Uranium Resources Inc., Kingsville Dome	Two 120×120 ft ponds	1990	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Vasquez	Two 150×150 ft ponds	1990	150×150 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Rosita	Two 120×120 ft ponds	1985	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Mestena, Alta Mesa	Evaporation data not found					
STMV, La Palangana	Evaporation data not found					

3.3.1 Radon Emission from Evaporation and/or Holding Ponds

Unlike conventional mills, ISL facilities do not produce tailings or other solid waste products. However, they do generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, an extraction solution (lixiviant), composed of ground water enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes the uranium. The resulting "pregnant" lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field. This is accomplished by bleeding off a portion of the process flow. Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant washdown. One method to dispose of these liquid wastes is to evaporate them from ponds. Deep well injection and land application (i.e., irrigation) are other methods for disposing of the liquid wastes. For these disposal methods, the waste liquid is collected in holding ponds until a quantity sufficient for disposal has been accumulated.

As defined by the AEA of 1954, as amended, byproduct material includes tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content (42 USC 2014(e)(2)). Clearly, waste water generated during solution mining is within this definition of byproduct material and is thus subject to the requirements of Subpart W.

The waste water contains significant amounts of radium, which will radiologically decay and generate radon gas. Radon diffuses much more slowly in water than it does in air. For example, the radon diffusion coefficient in water is about 10,000 times smaller than the coefficient in air (i.e., on the order of 10^{-5} square centimeters per second (cm^2/sec) for water and 10^{-1} cm^2/sec for air (Drago 1998, as reported in Brown 2010)). Thus, if the tailings piles are covered with water, then most of the radon would decay before it could diffuse its way through the water. However, since over time periods comparable to the half-life of radon, there is considerable water movement within a pond, advective as well as diffusive transport of radon from the pond water to the atmosphere must be considered. The water movement is partly caused by surface wind currents, thermal gradients, mechanical disturbance from the mill discharge pipe, and biological disturbances (animals, birds, etc.). Dye movement tests indicate that for shallow (less than 1 meter) pond water, advective velocities may exceed 1–2 millimeters per minute, resulting in virtually no radon containment by the surface water. If shallow water movement is sufficient to remove radon from the tailings-water interface and transport it to the atmosphere in a short time (several hours), the radon flux from the shallow tailings is nearly as great as that from similar bare saturated tailings; hence, no significant radon attenuation is gained by covering the tailings with water (Nielson and Rogers 1986). Consequently, in order for a pond covering a tailings pile to be effective at reducing the release of radon, the pond water must be greater than 1 meter in depth.

Additionally, if there is radium in the pond water, radon produced from that radium could escape into the atmosphere. A review of the various models used for estimating radon flux from the

surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model (Schwarzenbach et al. 2003)), coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond's water and the assumption that radon is in secular equilibrium with the radium. The radon flux from the surface of an evaporation pond, as a function of the wind speed (for winds less than 24 miles per hour (mph)), can be estimated using this model with the following equation:

$$J = \frac{1.48 \times 10^{-4}}{e^{-0.351V}} C_w \qquad (3\text{-}1)$$

Where	J	=	Radon flux	(pCi/(m^2-sec))
	C_w	=	Concentration of radium in the water	(pCi/L)
	V	=	Wind speed	(m/sec)

Implicit in this model is the fact that in pond water the radon diffusion coefficient is 10^{-5} cm^2/sec and that the thickness of the stagnant film layer can be estimated by an exponential relationship with wind speed (Schwarzenbach et al. 2003).

Baker and Cox (2010) measured the radium concentration in an evaporation pond at the Homestake Uranium Mill Site at 165 pCi/L. Assuming a direct conversion to Rn-222 (165 pCi/L), the flux is estimated from equation 3-1 at 1.65 pCi/(m^2-sec). This is comparable to measurements of the flux, which averaged 1.13 pCi/(m^2-sec). However, the Homestake measurement method did not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data were found for measurements of the radon flux on evaporation ponds versus wind speed.

The model should not be used for wind speeds above 10 meters per second (m/sec) (24 mph). However, this is not expected to be a major limitation for estimating normal radon releases and impacts from operational evaporation ponds.

Using actual radium pond concentrations and wind speed data in equation 3-1, the radon pond flux was calculated from several existing ISL sites (SC&A 2010). Results showed that the radon flux ranged from 0.07 to 13.8 pCi/(m^2-sec). This indicates that the radon flux above some evaporation ponds can be significant (e.g., can exceed 20 pCi/(m^2-sec)). If such levels occur, there are methods for reducing the radium concentration in the ponds, the most straightforward being dilution. However, this solution is temporary, as evaporation will eventually increase the concentration. A second method is to use barium chloride ($BaCl_2$) to co-precipitate the radium to the bottom of the pond. The radon generated at the depths of the bottom sediments will decay before reaching the pond surface.

Again using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from three sites. The evaporation pond contribution to the site's total radon release was small (i.e., less than 1%).

Two additional sources of radon release were investigated: the discharge pipe and evaporation sprays. The discharge pipe is used to discharge bleed lixiviant to the evaporation pond. Radon

releases occur when the bleed lixiviant exits the pipe and enters the pond. The investigation found that these radon releases are normally calculated using the methodology in NUREG-1569, Appendix D (NRC 2003); thus, this source is currently included in the total radon releases reported for an ISL site. For a "typical" ISL, with a purge water radon concentration of 3.2×10^5 pCi/L and a purge rate of 5.5×10^5 liters per day (L/d) or about 100 gallons per minute (gpm), NUREG-1569, Appendix D, calculated the radon released from the discharge pipe to be 64 Ci/yr.

Spray systems are sometimes used to enhance evaporation from the ponds. A model to calculate radon releases during spray operation was developed (SC&A 2010). Also, data from ISL ponds were used to estimate this source of radon release. The radon releases from spray operations were reported to range from <0.01 to <3 pCi/(m^2-sec) (SC&A 2010). Furthermore, operation of the sprays would reduce the radon concentration within the pond; therefore, the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium). Hence, operation of spray systems to enhance evaporation is not expected to significantly increase the amount of radon released from the pond.

3.4 Heap Leaching

Heap leaching is a process by which chemicals are used to extract the uranium from the ore. A large area of land is leveled with a small gradient, layering it with HDPE or linear low-density polyethylene (LLDPE), sometimes with clay, silt or sand beneath the plastic liner. Ore is extracted from a nearby surface or an underground mine. The extracted ore will typically be run through a crusher and placed in heaps atop the plastic. A leaching agent (often H_2SO_4) will then be sprayed on the ore for 30–90 days. As the leaching agent percolates through the heap the uranium will break its bonds with the oxide rock and enter the solution. The solution will then flow along the gradient into collecting pools from which it will be pumped to an onsite processing plant.

In the past, there have been a few commercial heap leach facilities, but currently none are operating. However, this type of facility can be rapidly constructed and put into operation. Planning and engineering have begun for two heap leach facilities. At the spring 2010 joint NMA/NRC Uranium Recovery Workshop, the NRC identified two proposed heap leach projects, one in Wyoming and the other in New Mexico, as shown in Table 11. In addition to these two projects, Cotter has indicated to the Colorado Department of Public Health and Environment that it intends to retain the use of the secondary impoundment at its Cañon City site for heap leaching in the future (Hamrick 2011).

Table 11: Anticipated New Heap Leach Facilities

Owner	Site	State
Energy Fuels[4]	Sheep Mountain	Wyoming
Uranium Energy Corporation	Grants Ridge	New Mexico

Source: NMA 2010

[4] Energy Fuels acquired the Sheep Mountain Project through its acquisition of Titan Uranium Inc. in February 2012 (http://www.energyfuels.com/development_projects/sheep_mountain/, accessed 9/25/2013).

Higher uranium prices will likely lead to the processing of low-grade ore currently found in the uranium districts in Wyoming and New Mexico. Much of the low-grade ore currently exists in spoil piles that were not economical to truck to milling operations. Little processing equipment is necessary to bring heap leach operations on line. Additionally, minimal personnel are necessary to operate and monitor such an operation. However, the application of NESHAP Subpart W to heap leach facilities should be clarified (see Section 5.0). At a minimum, it is expected that these types of facilities will be limited in acreage according to the Subpart W standard and will be required to have synthetic liners with monitored leak detection systems.

Attempts have been made at heap-leaching low-grade uranium ore, generally by the following process:

(1) Small pieces of uncrushed ore are placed in a pile, or “heap”, on an impervious pad of plastic, clay, or asphalt, to prevent uranium and other chemicals from migrating into the subsurface.

(2) An acidic solution is then sprayed onto the heap, which dissolves the uranium as it migrates through the ore.

(3) Perforated pipes under the heap collect the uranium-rich solution, and drain it to collection basins, from where it is piped to the processing plant.

(4) At the processing plant, uranium is concentrated, extracted, stripped, and dried to produce a material called “yellowcake.”

(5) Finally, the yellowcake is packed in 55-gallon drums to be transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 10 shows a schematic of a typical heap-leaching uranium recovery facility.

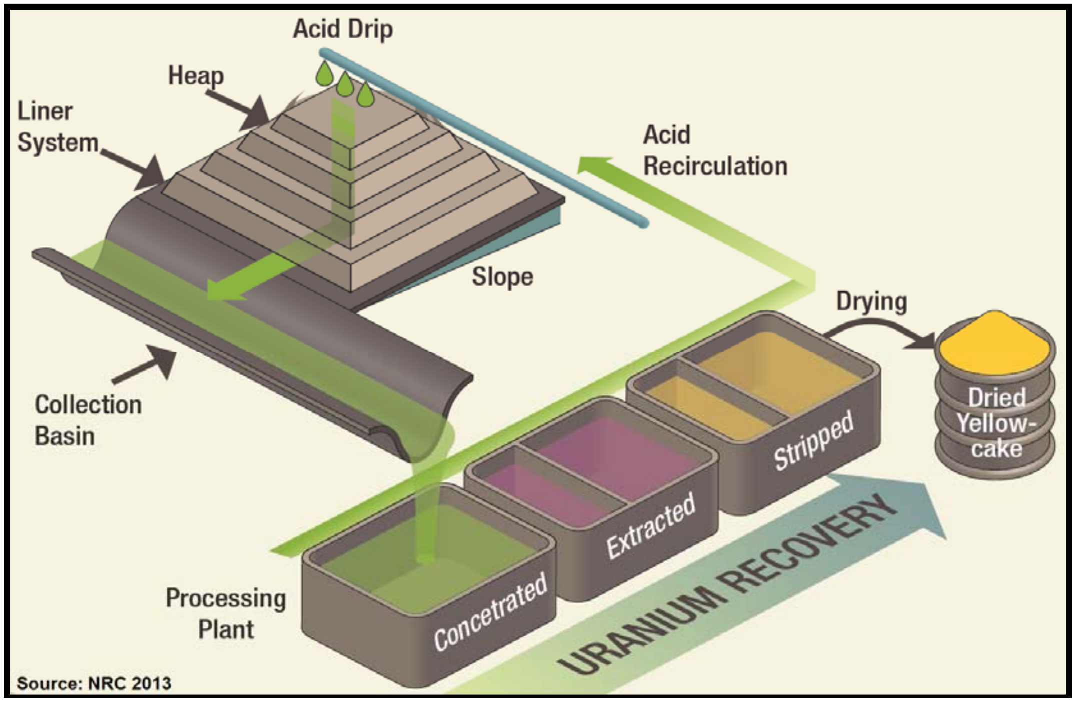


Figure 10: Typical Heap-Leaching Uranium Recovery Facility

Heap-leaching was not an industry trend; rather, it was an attempt to process overburden that contained a minimal concentration of uranium. Production records associated with this processing technique were not maintained, but certainly the technique represented less than 1% of the recovered uranium resources. Almost all of the conventional uranium recovery operations were stand-alone facilities that included the mining, milling, processing, drying, and containerization of the yellowcake product. The yellowcake product was then trucked to processing facilities that refined the raw materials into the desired product.

3.4.1 Sheep Mountain Mine, Energy Fuels, Fremont County, Wyoming

The Sheep Mountain mine, located at approximate 42º 24’ North and 107º 49’ West, has operated as a conventional underground mine on three separate occasions. Mining on the Sheep Mountain property started in 1956 and continued in several open pit and underground operations until 1982. The Sheep I shaft was sunk in 1974, followed by the Sheep II shaft in 1976. Production from the Sheep I shaft in 1982 was reported to be 312,701 tons at an average grade of 0.107% U_3O_8 (triuranium octoxide). In 1987, an additional 12,959 tons at 0.154% U_3O_8 were produced, followed by 23,000 tons at 0.216% U_3O_8 in 1988. The Sheep II shaft has had no production. The Congo Pit is essentially a single open pit which was being readied for development in the early 1980s, but plans were never realized because of the collapse of the uranium market. Feed from Sheep Mountain was processed at the Split Rock Mill, which was located north of Jeffrey City. Figure 11 shows the Sheep Mountain mine.

Figure 11: Sheep Mountain – Aerial View

Energy Fuels plans to develop the Sheep Mountain mine with both conventional underground and open pit mining, followed by heap leach extraction of the uranium with an ion-exchange recovery plant producing up to 1.5 million pounds of U_3O_8 per year. Energy Fuels' plans include the development of both the Sheep I and Sheep II underground mines, with access from twin declines. At its peak production, the underground mine will produce approximately 1.0 million pounds U_3O_8 per year. The Congo Pit will also be developed, producing an average of 500,000 pounds U_3O_8 per year. Recovery of the uranium will include heap leach pads using H_2SO_4 and a conventional recovery plant, through to yellowcake production on site. Assuming no re-use of heap pads, there will be 100 heap leaching cells, each with a capacity of 66,000 tons of material stacked to a height of 25 feet (ft) over an area of 40 ft by 100 ft. The mineral processing rate will be 500,000 tons per year or greater (Titan Uranium 2010).

Currently, the Wyoming Department of Environmental Quality has issued a fully bonded mining permit to Titan (now Energy Fuels). Energy Fuels is in the process of developing a source material license application for submittal to the NRC around mid-2011. The review and approval process is expected to take about 2 years (i.e., the NRC will complete it in mid-2013). Finally, the Plan of Operation (POO) is being developed and expected to be submitted to the U.S. Bureau of Land Management also around mid-2011. Submittal of the POO will trigger development of an environmental impact statement (EIS). This POO/EIS process is expected to be completed by the end of 2012 (Titan Uranium 2011).

3.5 Method 115 to Monitor Radon Emissions from Uranium Tailings

Subpart W (40 CFR 61.253) requires that compliance with the existing emission standards for uranium tailings be achieved through the use of Method 115, as prescribed in Appendix B to 40 CFR 61. Method 115 consists of numerous sections that discuss the monitoring methods that

must be used in determining the Rn-222 emissions from underground uranium mines, uranium mill tailings piles, phosphogypsum stacks, and other piles of waste material that emits radon.

For uranium tailings piles, Method 115, Section 2.1.3, specifies the minimum number of flux measurements considered necessary to determine a representative mean radon flux value for each type of region on an operating pile:

- Water covered area—no measurements required as radon flux is assumed to be zero.
- Water saturated beaches—100 radon flux measurements.
- Loose and dry top surface—100 radon flux measurements.
- Sides—100 radon flux measurements, except where earthen material is used in dam construction.

The requirement of 300 measurements may result in more measurements then are necessary under the Subpart W design standards. For example, under design standard 40 CFR 61.252(b)(2) for continuous disposal, only 10 acres are uncovered at one time. The 300 flux measurements on a 10-acre area translate into one measurement every 1,500 ft^2, or one every 40 ft. At the time Method 115 was developed and amended to Appendix B (i.e., 1989), the uranium tailings areas were much larger than the Subpart W design standards presently allow. For example, DOE/EIA-0592 (1995) indicates that some mills had tailings areas of over 300 acres (although not necessarily in a single pile).

Method 115, Section 2.1.6, indicates that measuring "radon flux involves the adsorption of radon on activated charcoal in a large-area collector." Since 1989, there have been advances in methods of measuring radon flux. George (2007) is particularly relevant in terms of radon measuring devices:

> *In the last 20 years, new instruments and methods were developed to measure radon by using grab, integrating, and continuous modes of sampling. The most common are scintillation cell monitors, activated carbon collectors, electrets, ion chambers, alpha track detectors, pulse and current ionization chambers, and solid state alpha detectors.*

In George (2007) radon detection is divided into:

I. Passive integrating radon measurements

   (1) Activated carbon collectors of the open face or diffusion barrier type. Charcoal canisters often employ a gamma spectrometer to count the radon daughters as surrogates (bismuth-214, for example). Liquid scintillation vials also use alpha and beta counting. About 70% of radon measurements in the United States are canister type.

(2) Electret ion chambers are being used for 2–7 days duration to measure the voltage reduction (drop). The voltage drop on the electrets is proportional to the radon concentration. About 10%–15% of radon measurements use this methodology.

(3) Alpha track detectors are used for long-term measurements. Alphas from radon penetrate a plastic lattice, which is etched with acid, and the resulting tracks are counted. There is some use in the United States, but this is more popular in Europe.

II. Passive or active continuous radon measurements

(1) Scintillation cell monitors mostly include the flow-through type.

(2) Current and pulse ionization chambers (mostly passive).

(3) Solid state devices are either passive or active if they use a pump to move air through the sensitive volume of the monitor like the RAD 7, which uses a solid state alpha detector (passive implanted planar silicon (PIPS) detector).

Additionally, the Oak Ridge Institute for Science and Education (ORISE) compared various radon flux measurement techniques (ORISE 2011), including activated charcoal containers, the Electric Passive Environmental Radon Monitor (E-PERM) electret ion chamber, the AlphaGUARD specialized ionization chamber, semiconductor detectors to measure radon daughters, and ZnS(Ag) (silver doped zinc sulfide) scintillation detectors. ORISE stated that the last two techniques were not yet commercially available and that the AlphaGUARD detector was "expensive," and thus they are not currently candidates for radon flux monitoring of uranium tailings. Comparing the activated charcoal containers to the E-PERM, ORISE found that while both were easy to operate and relatively inexpensive, the E-PERM showed smaller variations in measurements, and the activated charcoal containers had higher post-processing costs. The only disadvantage of the E-PERM was that its Teflon disks must be replaced after each use. Based on this comparison, ORISE recommended that for a large number of measurements, such as those needed to comply with Subpart W, E-PERM flux monitors would be best.

This brief review of Method 115 demonstrates that its use can still be considered current for monitoring radon flux from uranium tailings. However, it is important to note that the specific design protocols were developed for use at larger tailings impoundments. Alternatively, many commercial enhancements to that design are widely available and in use today. Other forms of passive detectors, as well as active measurement detectors, are also acceptable alternatives to demonstrate conformance with the standard. In addition, the method as currently written has some elements and requirements that should be reviewed and possibly revised, particularly the location and the frequency of measurement. These would be better based on statistical considerations or some other technical basis. Additional discussion of the continued applicability of Method 115 appears in SC&A 2008, ORISE 2011, and George 2007.

4.0 CURRENT UNDERSTANDING OF RADON RISK

Subpart W regulates the emission of radon from operating uranium recovery facility tailings. To enhance the understanding of the need for Subpart W, this section presents a qualitative review and analysis of changes in the analysis of the risks and risk models associated with radon releases from uranium recovery tailings since the publication of the 1989 BID (EPA 1989). After presenting some brief radon basics, the analysis focuses on three areas that have evolved: radon progeny equilibrium fractions, empirical risk factors, and the development of dosimetric risk factors. Finally, Section 4.4 presents the results of a risk assessment performed using current methodology (i.e., CAP88, Version 3 (TEA 2007)), 2011 estimated population distributions, and historical radon release data. Section 4.4 also discusses and compares the current calculated risks to the 1989 risk assessment results, presented in Section 2.3.

4.1 Radon and Dose Definitions

Rn-222 is a noble gas produced by radioactive decay of Ra-226. As shown in Figure 12, one of the longer-lived daughters in the uranium (U)-238 decay series, Ra-226 is a waste product in uranium tailings and liquids from uranium recovery facilities. These include mills, evaporation and surge ponds, typically found in ISL facilities, and heap leach piles. Radium (and its daughter radon) is also part of the natural radiation environment and is ubiquitous in soils and ground water along with its parent uranium.

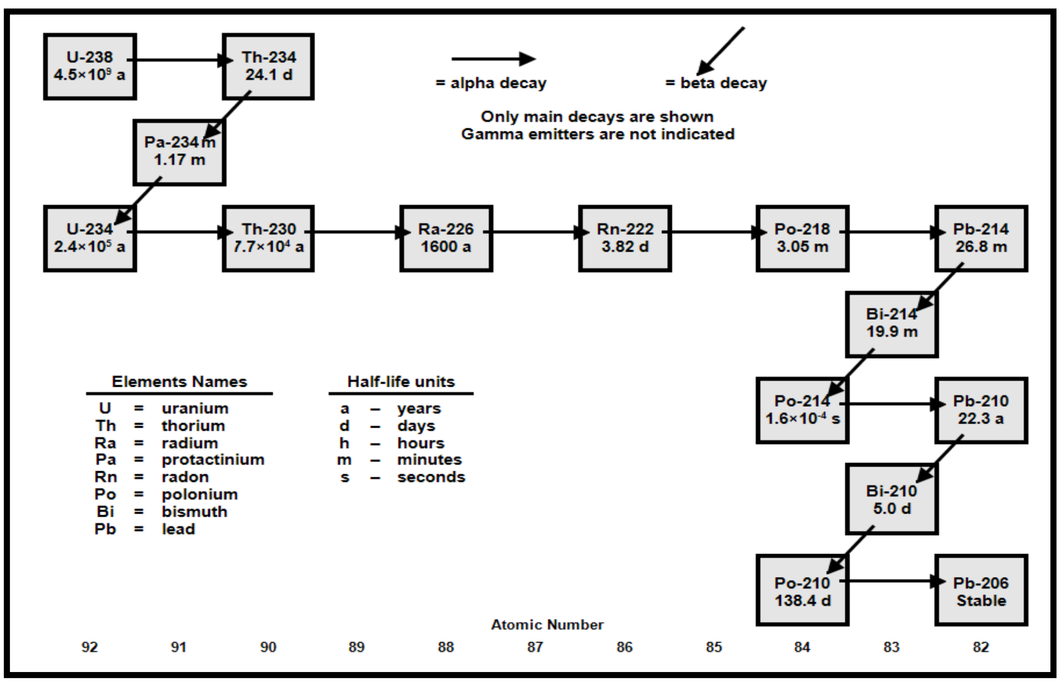


Figure 12: Uranium Decay Series

Radon, with a half-life of 3.8 days, decays into a series of short half-life daughter products or progeny. Being chemically inert, most inhaled radon is quickly exhaled. Radon progeny, however, are charged and electrostatically attach themselves to inhalable aerosol particulates, which are deposited in the lung or directly onto lung tissue. These progeny undergo decay,

releasing alpha, beta, and gamma radiation that interacts directly with lung tissue. Of these interactions, alpha particles from polonium-218 and polonium-214 are the most biologically damaging. The resulting irritation of lung cell tissue particularly from these alpha particles enhances the risk of developing a lung cancer. Determining an estimate of the risk of developing a cancer is of primary importance to establishing the basis for any regulatory initiatives.

4.2 Radon Risk Factors

In 1988, the National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) presented a report on the health risks of radon (BEIR IV, NAS 1988). BEIR IV derived quantitative risk estimates for lung cancer from analyses of epidemiologic data from underground miners. The risk factor presented in BEIR IV for radon was 350 cancer deaths per million person-WLMs[5] of exposure.

The International Commission on Radiological Protection (ICRP), in its Publication 50 (ICRP 1987), addressed the question of lung cancer risk from indoor radon daughter exposures. The ICRP Task Group took a direction quite different from that of the BEIR Committee. The Task Group reviewed published data on three miner cohorts: U.S., Ontario, and Czech uranium miners. When the ICRP 50 relative risk model was run with the 1980 U.S. life table and vital statistics, the combined male and female reference risk was calculated in the 1989 BID to be 4.2×10^{-4} cancer deaths per WLM.

In the 1989 BID, EPA averaged the male and female BEIR IV and ICRP 50 risk coefficients and adjusted the coefficients for background, so that the risk of an excess lung cancer death for a combined population (men and women) was 3.6×10^{-4} WLM^{-1}, with a range from 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1} (EPA 1989).

In addition to epidemiological radon risk coefficients, dosimetric models have been developed as a widely acceptable approach to determine the effects of exposures to radon progeny. One of the principal dosimetric models used to calculate doses to the lung following inhalation of radon and its daughters is the ICRP Human Respiratory Tract Model (HRTM), first introduced in ICRP Publication 66 (ICRP 1994). The ICRP used the HRTM to develop a compilation of effective dose coefficients for the inhalation of radionuclides, presented in Publication 72 (ICRP 1996).

Shortly after the publication of ICRP Publication 72, and using the information in that report, EPA developed Federal Guidance Report 13 (FGR 13) (EPA 1999)[6]. In addition to the risk factors given in FGR 13 itself, the FGR 13 CD Supplement (EPA 2002) provides dose factors, as well as risk factors, for various age groups. For this study, the dose and risk factors from the

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[5] Radon concentrations in air are commonly expressed in units of activity (e.g., picocuries (pCi) or becquerels) per unit volume (e.g., liters (L)); however, radon progeny concentrations are commonly expressed as working levels (WLs). In a closed volume, the concentration of short-lived radon progeny will increase until equilibrium is reached, under these conditions, each pCi/L of radon will give rise to (almost precisely) 0.01 WL, or 100 pCi/L = 1 WL (EPA 2003). Exposure to 1 WL for 1 month (i.e., 170 hours) is referred to as 1 working level month (WLM).

[6] Since FGR 13 was published, several organizations have produced updated radiation risk estimates. EPA 2011 reviewed the update risk estimates and concluded that the new mortality estimates do not differ greatly from those in FGR-13.

FGR 13 CD Supplement were used to calculate the dose and risk due to exposure to 1 WLM of radon and its progeny. The calculation assumed a radon airborne concentration of 100 pCi/L, a radon progeny equilibrium fraction of 0.4, a breathing rate of 0.9167 cubic meters per hour (m^3/hr), and an exposure duration of 170 hours.

The results of this calculation demonstrate that the FGR 13 based radon progeny lung dose conversion factor is between about 2.1 to 7.0 millisieverts (mSv)/WLM, depending on the age of the individual being exposed. The results also show that the lifetime fatality coefficient from lung exposure is between about 6×10^{-4} to 2.4×10^{-3} WLM^{-1}, depending on the exposed individual's age. This agrees well with the factor calculated from empirical data.

In conclusion, the radon progeny risk factor from FGR 13 of 6×10^{-4} WLM^{-1} used in this analysis falls within the risk factor range identified in the 1989 BID (i.e., 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1}), and is about 67% larger than the 3.6×10^{-4} WLM^{-1} radon progeny risk factor used in the 1989 BID. Thus, the radon progeny risk factor used in this Subpart W analysis updates the risk factor used in the 1989 BID to reflect the current understanding of the radon risk, as expressed by the ICRP and in FGR 13.

4.3 Computer Models

Various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium mines were compared. Seven computer programs were considered for use in the uranium tailings radon risk assessment: CAP88 Version 3.0, RESRAD-OFFSITE, MILDOS, GENII, MEPAS, AIRDOS, and AERMOD. A detailed selection process was used to select the program from the first five programs listed. AIRDOS was not included in the detailed selection process, since it is no longer an independent program, but has been incorporated into CAP88 Version 3.0. Because it calculates only atmospheric dispersion, but not radiological doses or risks, AERMOD was also not included. The five remaining programs received a score between 0 and 5 for each of the following 11 criteria: (1) Exposure Pathways Modeled, (2) Population Dose/Risk Capability, (3) Dose Factors Used, (4) Risk Factors Used, (5) Meteorological Data Processing, (6) Source Term Calculations, (7) Verification and Validation, (8) Ease of Use/User Friendly, (9) Documentation, (10) Sensitivity Analysis Capability, and (11) Probabilistic Analysis Capability. Also, each criterion had a weighting factor of between 1 and 2. The total weighted score was calculated for each code, and CAP88 was selected for use in this evaluation. A more complete discussion of the selection of the risk assessment computer code appears in SC&A 2010.

As described in Section 2.3, the 1989 BID used the computer codes AIRDOS-EPA, RADRISK, and DARTAB to calculate the risks due to radon releases from uranium tailings. Subsequent to the publication of the 1989 BID, CAP88 Version 3.0 was produced. CAP88 Version 3.0 was originally composed of the AIRDOS-EPA and DARTAB computer codes and the dose and risk factors from RADRISK (see Section 2.3). CAP88 Version 3.0 was first used for DOE facilities to calculate effective dose equivalents to members of the public to ensure compliance with the then-issued NESHAP Subpart H rules (TEA 2007). Currently, CAP88 Version 3.0 incorporates the dose and risk factors from FGR 13 for determining risks from radionuclides, including the radon decay daughters.

When calculating doses and risk from Rn-222, CAP88 Version 3.0 can be run in two different modes, either normally or in the "radon only" mode. When run in the normal mode, CAP88 Version 3.0 treats radon and its progeny as any other radionuclide and its progeny would be treated. That is, the radon is decayed as it travels from the release point to the dose receptor location, and the in-growth of the progeny is calculated. At the dose receptor location, doses are calculated assuming all the normal exposure pathways, including inhalation and air submersion, that are normally associated with radon doses, and also the exposure pathways from the longer lived radon progeny that deposit onto the ground, including ground shine and food ingestion. To perform these calculations, CAP88 Version 3.0 used the dose and risk factors from FGR 13.

In the "radon only" mode, CAP88 Version 3.0 calculates the risk from the radon WL concentration, but not the dose. The annual risk to an individual or population at a location is simply the WL concentration multiplied by a risk coefficient. The risk coefficient used by CAP88 Version 3.0 is 1.32 cancer fatalities per year per WL. Although this risk coefficient is not documented in any of the CAP88 Version 3.0 user manuals, so its origin is unknown, it can be derived from the CAP88 Version 3.0 output files. A risk coefficient of 1.32 $WL\text{-}year^{-1}$ is equivalent to 2.56×10^{-2} cancer deaths per WLM, which is about two orders of magnitude larger than the risk coefficient discussed in Section 4.2. Thus, CAP88's "radon only" mode was not used to calculate the risk estimates that are summarized in the next section. Rather, the risk estimates are based on CAP88's atmospheric transport model (for radon decay and progeny buildup) and the radionuclide-specific risk factors from FGR 13.

4.4 Uranium Recovery Facility Radon Dose and Risk Estimates

To perform the CAP88 dose/risk analysis, three types of data were necessary: (1) the distribution of the population living within 80 km (50 mi) of each site, (2) the meteorological data at each site, particularly the wind speed, wind direction, and stability class, and (3) the amount of radon annually released from the site.

Dose/risk assessments were performed for the uranium recovery sites identified in Table 12, which include conventional uranium mills and ISL mines, plus two hypothetical generic sites developed to represent the western and eastern United States.

Table 12: Uranium Recovery Sites Analyzed

Mill / Mine	Type	State	Regulator	Latitude			Longitude		
				deg	min	sec	deg	min	sec
Crow Butte	In-Situ Leach	NE	NRC	42	38	41	-103	21	8
Western Generic	Conventional	NM	NRC	35	31	37	-107	52	52
Alta Mesa 1, 2, 3	In-Situ Leach	TX	State	26	53	59	-98	18	29
Kingsville Dome 1,3	In-Situ Leach	TX	State	27	24	54	-97	46	51
White Mesa Mill	Conventional	UT	State	37	34	26	-109	28	40
Eastern Generic	Conventional	VA	NRC	38	36	0	-78	1	11
Smith Ranch - Highland	In-Situ Leach	WY	NRC	43	3	12	-105	41	8
Christensen/Irigaray	In-Situ Leach	WY	NRC	43	48	15	-106	2	7
Sweetwater Mill	Conventional	WY	NRC	42	3	7	-107	54	41

Normally, the population doses and risks are calculated out to a distance of 80 km (50 mi) from the site. Therefore, it was necessary to know the population to a distance of 80 km from each site in each of the 16 compass directions. This information is not normally available from U.S. Census Bureau data. However, in 1973, EPA wrote a computer program, SECPOP (Sandia 2003), which would convert census block data into the desired 80-km population estimates for any specific latitude and longitude within the continental United States. The NRC adopted this program to perform siting reviews for license applications and has updated the program to use the 2000 census data. SC&A (2011) used the SECPOP program to estimate the population distribution around each site; that population was then modified to account for changes in the population from 2000 to 2010.

For those sites where site-specific meteorological data were identified, those site-specific data were used. For other sites, CAP88 Version 3.0 is provided with a weather library of meteorological data from over 350 National Weather Service stations. For sites without site-specific meteorological data, data from the National Weather Service station nearest the site were used.

Annual radon release estimates were determined for each site based on the available documentation for the site. For example, some sites reported their estimated radon release in their semiannual release reports, while other sites calculated their radon release as part of their license application or renewal application. Finally, for some sites, the annual radon release estimates were obtained from the NRC-produced, site-specific environmental assessment. If multiple documents provided radon release estimates for a particular site, the estimate from the most recent document was used. Consistent with the 1989 assessment, in order to bound the risks, radon releases were estimated from both process effluents and impoundments. Likewise, if both theoretical and actual radon release values were identified for a site, the actual radon release value was given preference.

Additional descriptions of each site's population, meteorology, and radon source term may be found in SC&A 2011. Doses and risks to the RMEI and to the population living within 80 km of the facility were calculated. The RMEI is someone who lives near the facility and is assumed to have living habits that would tend to maximize his/her radiation exposure. For example, the RMEI was assumed to eat all of his/her vegetables from a garden located nearest the facility, which is contaminated with radon progeny as a result of radon releases from the facility. On the other hand, population doses and risks are based on the number of individuals who live within 80 km of the facility. These people are also assumed to eat locally grown vegetables, but not necessarily from the garden located nearest the facility. The RMEI's dose and risk are included within the population dose and risk, since he/she lives within the 80-km radius.

Table 13 presents the RMEI and population doses and risks due to the maximum radon releases estimated for each uranium site.

Table 13: Calculated Maximum Total Annual RMEI, Population Dose and Risk

Uranium Site	Maximum Radon Release (Ci/yr)	Annual Dose		LCF[a, b] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	0.5	1.2	2.9E-06	6.0E-07
White Mesa	1,750	5.2	12.0	3.4E-05	6.4E-06
Smith Ranch - Highlands	36,500	3.7	1.5	2.3E-05	7.7E-07
Crow Butte	8,885	2.7	3.3	1.7E-05	1.7E-06
Christensen/Irigaray	1,600	3.8	1.9	2.4E-05	9.9E-07
Alta Mesa	740	21.6	11.5	1.3E-04	6.1E-06
Kingsville Dome	6,958	58.0	11.3	3.8E-04	6.1E-06
Eastern Generic	1,750	200.3	28.2	1.4E-03	1.6E-05
Western Generic	1,750	5.1	6.0	2.7E-04	7.7E-06

[a]Latent Cancer Fatalities

[b]In this table all risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39.

Table 14 presents the RMEI and population doses and risks due to the average radon releases estimated for each uranium site. The risks were based on average radon releases to make it easier to convert these annual risk values into lifetime risk values. This conversion is done by simply multiplying the Table 14 values by the number of years that the facility operates for the population risk, or by the length of time that the individual lives next to the facility for the RMEI risk.

Table 14: Calculated Average Total Annual RMEI, Population Dose and Risk

Uranium Site	Average Rado n Release (Ci/yr)	Annual Dose		LCF[a] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Populatio n	RMEI
Sweetwater	1,204	0.3	0.7	1.7E-06	3.5E-07
White Mesa	1,388	3.0	7.0	2.0E-05	3.7E-06
Smith Ranch - Highland s	21,100	2.2	0.9	1.3E-05	4.5E-07
Crow Butte	4,467	1.6	1.9	1.0E-05	1.0E-06
Christensen/Irigaray	1,040	2.2	1.1	1.4E-05	5.7E-07
Alta Mesa	472	12.5	6.7	7.6E-05	3.6E-06
Kingsville Dome	1,291	33.6	6.6	2.2E-04	3.5E-06
Eastern Generic	1,388	116.3	16.4	7.9E-04	9.2E-06
Western Generic	1,388	3.0	3.5	1.6E-04	4.4E-06

[a]Latent Cancer Fatalities

The dose and risk to an average member of the population within 0–80 km of each site may be calculated by dividing the population doses and risks from Table 13 and Table 14 by the population for each site. Table 15 shows the results of that calculation.

Table 15: Dose and Risk to an Average Member of the Population

Uranium Site	Dose (mrem)		LCF[a] Risk (yr^{-1})	
	Average Release	Maximum Release	Average Release	Maximum Release
Sweetwater	0.03	0.05	1.6E-07	2.7E-07
White Mesa	0.15	0.25	9.6E-07	1.6E-06
Smith Ranch - Highlands	0.03	0.05	1.7E-07	2.9E-07
Crow Butte	0.05	0.08	3.1E-07	5.3E-07
Christensen/Irigaray	0.06	0.11	3.8E-07	6.6E-07
Alta Mesa	0.03	0.05	1.6E-07	2.7E-07
Kingsville Dome	0.07	0.13	4.8E-07	8.3E-07
Eastern Generic	0.05	0.09	3.7E-07	6.4E-07
Western Generic	0.04	0.07	2.2E-06	3.8E-06

[a]Latent Cancer Fatalities

As Table 15 shows, the annual latent cancer fatality (LCF) risk to an average member of the population surrounding a uranium site ranges from 1.6×10^{-7} to 1.6×10^{-6} for the seven actual sites, and from 3.7×10^{-7} to 3.8×10^{-6} for the two hypothetical generic sites.

The study estimated that the annual fatal cancer risk to the RMEI ranges from 3.5×10^{-7} to 6.4×10^{-6} for the seven actual sites, and from 4.4×10^{-6} to 1.6×10^{-5} for the two hypothetical generic sites. The highest annual individual risk occurred at the Eastern Generic site, which is not surprising considering that the nearest individual was assumed to reside only about 1 mi from the hypothetical site. It is likely that during the site selection process for an actual facility, a site this close to residences would be eliminated and/or the design of the facility would include features for reducing radon emissions in order to reduce the RMEI risk.

The lifetime risk would depend on how long an individual was exposed. For example, for the seven actual sites analyzed, assuming that the uranium mill operates for 10 years, then the lifetime fatal cancer risk to the RMEI would be 3.5×10^{-6} to 3.7×10^{-5}. Alternatively, if it is assumed that an individual was exposed for his/her entire lifetime (i.e., 70 years), then the lifetime fatal cancer risk to the RMEI would be 2.45×10^{-5} to 2.59×10^{-4}. For the two hypothetical generic sites, the lifetime fatal cancer risk to the RMEI would be 4.4×10^{-5} to 9.2×10^{-5} assuming 10 years of mill operation, or 3.1×10^{-5} to 6.44×10^{-5} assuming 70 years of mill operation. The lifetime risk calculation uses only the average radon release results, because while the maximum could occur for a single year, it is unlikely that the maximum would occur for 10 or 70 continuous years.

The study also estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 km of the sites.

4.5 Summary of Radon Risk

This section described the evolution in the understanding of the risk presented by radon and its progeny since the 1989 BID was published. Additionally, the computer code CAP88 Version 3.0 was used to analyze the radon risk from seven operating uranium recovery sites and two generic sites.

The lifetime MIR calculated using data from seven actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments (see Section 2.3.1), while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments (see Section 2.3.2).

In protecting public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}) the lifetime MIR. Although the calculated high end of the lifetime MIR range is above 10^{-4}, the assumptions that radon releases occur continuously for 70 years and that the same RMEI is exposed to those releases for the entire 70 years are very conservative.

Similarly, the risk assessment estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years among the 1.8 million persons living within 80 km of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km of the sites was 0.0043, which was less than one case every 200 years for existing impoundments, and 0.014, or approximately one case every 70 years for new impoundments (see Sections 2.3.1 and 2.3.2).

5.0 EVALUATION OF SUBPART W REQUIREMENTS

The evaluation of Subpart W requirements required analyses of several items to determine if the current technology had advanced since the promulgation of the rule. These topics are listed below, along with the key issues addressed in this report to determine whether the requirements of Subpart W are necessary and sufficient.

5.1 Items Reviewed and Key Issues

Each of these items will be reviewed with reference to the relevant portions of this document:

(1) Review and compile a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed.

Key Issue – The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures and facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

(2) Compare and contrast those technologies with the engineering requirements of hazardous waste impoundments regulated under RCRA Subtitle C disposal facilities, which are used as the design basis for existing uranium byproduct material (i.e., tailings) impoundments.

Key Issue – All new impoundments shall adopt the design and engineering standards referred to through 40 CFR 192.32(a)(1).

(3) Review the regulatory history.

Key Issue – NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.

(4) Tailings impoundment technologies.

Key Issue – The emission limit for impoundments that existed as of December 15, 1989, has been demonstrated to be both achievable and sufficient to limit risks to the levels that were found to protect public health with an ample margin of safety.

The requirement that impoundments opened after December 15, 1989, use either phased or continuous disposal technologies as appropriate to ensure that public health is protected with an ample margin of safety, which is consistent with section 112(d) of the 1990 Amendments of the CAA, which requires standards based on GACT.

(5) Radon measurement methods used to determine compliance with the existing standards.

Key issue – The approved method (Method 115, 40 CFR 61, Appendix B) of monitoring Rn-222 to demonstrate compliance with the emission limit for impoundments that existed as of December 15, 1989, is still valid.

(6) Compare the 1989 risk assessment with current risk assessment approaches.

Key Issue – Adoption of a lower emission limit is not necessary to protect public health, as the current limit has been shown to be protective of human health and the environment. Impact costs associated with the limit are considered to be acceptable.

5.1.1 Existing and Proposed Uranium Recovery Facilities

Sections 3.2, 3.3, and 3.4 describe the three types of uranium recovery facilities: conventional mills, ISL facilities, and heap leach facilities. Each facility type is briefly described below.

Conventional Mills

Section 3 of this report presents a review of the existing and proposed uranium recovery facilities. As indicated, there are five conventional mills at various stages of licensing, with various capacities to receive tailings. Of these five conventional mills, only White Mesa is

operational. Some of these were constructed before December 15, 1989, and fall under the Subpart W monitoring requirement. Table 16 shows the current conventional mills with pre-December 15, 1989 conventional impoundments.

Table 16: Current Pre-December 15, 1989 Conventional Impoundments

Conventional Mill Name	Regulatory Status	Pre-December 15, 1989 Impoundments
Sweetwater	Standby,* license expires November 2014	37 acres not full
Shootaring Canyon	Standby,* license extension May 2013	Only 7 acres of impoundment filled
White Mesa	Active, license expires March 2015	Cell 2 closed, Cell 3 almost full

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

The White Mesa Mill (see Section 3.2.2) has one pre-1989 cell (Cell 3) that is authorized to accept tailings and is still open. Cell 2 is closed. Both cells are monitored for radon flux. The average radon flux for Cell 2 was calculated at 13.5 pCi/(m^2-sec), while that at Cell 3 was 8.9 pCi/(m^2-sec). The mill also uses an impoundment constructed before 1989 as an evaporation pond.

The Sweetwater Mill (see Section 3.2.1) has a 60-acre tailings management area with a 37-acre tailings impoundment of which 28 acres are dry with an earthen cover. The remainder is covered by water. The radon flux from this impoundment is monitored yearly. The average flux (using Method 115) for the entire impoundment was 6.01 pCi/(m^2-sec), including the water-covered area, which had an assumed flux of zero.

The Shootaring Canyon Mill (see Section 3.2.3) had plans for an upper and lower impoundment, but only the upper impoundment was constructed. As the mill operated for approximately 30 days, only about 7 acres of tailings were deposited in the upper impoundment. These have a soil cover. The average radon flux from the covered tailings was measured using Method 115 at 11.9 pCi/(m^2-sec) in April 2010.

The Piñon Ridge Mill (see Section 3.2.4) is a permitted conventional uranium recovery facility in Montrose County, Colorado. The facility has not been constructed; however, there are current activities at the site, including a pre-operational environmental monitoring program.

In-Situ Recovery

As discussed in Section 3.3, ISL was first conducted in 1963 and soon expanded so that by the mid-1980s, a fair proportion of the recovered uranium was by ISL. Table 8shows the ISL facilities in the United States that are currently operational. As previously discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining. Thus, approximately 23 facilities are restarting, expanding, or planning for new operations (see Table 9).

Of particular importance to Subpart W are the impoundments that are an integral part of all ISL facilities. These impoundments are required to maintain the hydrostatic gradient toward the leach

field to minimize excursions referred to as "flare," a proportionality factor designed to estimate the amount of aquifer water outside of the pore volume that has been impacted by lixiviant flow during the extraction phase. While these impoundments typically do not reach the size and scale of conventional tailings piles, they are an integral component of ISL, contain various amounts of radium, and can function as sources of radon gas. Section 3.3.1 provides the mathematical framework for estimating the quantity of radon being emitted from an impoundment. The subsequent discussion of Subpart W, including a proposed standard for impoundments constructed after December 15, 1989, will further evaluate this radon flux.

Heap Leach Facilities

The few commercial heap leach facilities established in the 1980s have been shut down. Recently, however, two heap leach facilities have been proposed: one in Wyoming (Sheep Mountain – Energy Fuels) and one in New Mexico (Grants Ridge, Uranium Energy Corporation) (see Section 3.4). If the price of uranium increases, then recovery of uranium from heap-leaching low-grade ores will become economically attractive and will likely lead to additional facilities. The question to be addressed from the standpoint of Subpart W is the radon flux released from the active heap leach pile. Also, once the uranium is removed from the ore in the heap leach pile, the spent ore becomes a byproduct material much like the tailings, albeit not mobile. This spent ore contains radium that releases radon. As the heap leach pile is constructed to allow lixiviant to "trickle through" the pile, these same pathways could allow for radon release by diffusion out of the spent ore and then through the pile, which is addressed under Subpart W.

5.1.2 RCRA Comparison

Both alternative disposal methods presented in Subpart W (work practices) require that tailings impoundments constructed after December 15, 1989, meet the requirements of 40 CFR 192.32(a)(1). Tailings impoundments include surface impoundments, which are defined in 40 CFR 260.10:

> *Surface impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.*

The above definition encompasses conventional tailings ponds, ISL ponds, and heap leach piles. The last is included as it is assumed that the heap leach pile will be diked or otherwise constructed so as not to lose pregnant liquor coming from the heap.

This being the case, 40 CFR 264.221(a) states that the impoundment shall be designed and constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Requirements of the liner system listed in 40 CFR 264.221(c) include:

(1)(i)(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life.

(1)(i)(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 ft (91 centimeters (cm)) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec).

The regulation also requires a leachate collection system:

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system.* This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period.

Other requirements for the design and operation of impoundments, given in 40 CFR 264 Subpart K, include construction specifications, slope requirements, and sump and removal requirements. The above requirements are important to new uranium containment/impoundment systems because of the potential that water will be used to limit the radon flux from a containment/impoundment. Thus, it is also important to minimize the potential for ground water or surface water contamination. For conventional mill tailings impoundments, the work practices require a soil cover. With heap leach piles, the moisture in the heap would limit radon during operations, and after operations, a degree of moisture would be required to ensure that the radon diffusion coefficient is kept low (see Section 5.4).

5.1.3 Regulatory History

Section 2.0 reviewed the regulatory history of Subpart W. This review indicates that NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA. The following presents the use of GACT (see Section 5.3) in detail and describes its use in conventional and other than conventional uranium recovery.

5.1.4 Tailings Impoundment Technologies

Sections 2.3.1 and 2.3.2 discuss tailings impoundment technologies. The two primary changes to the technology as it was previously practiced were first that owners and/or operators of conventional mill tailings impoundments must meet the requirements of 40 CFR 192.32(a)(1) and second that they must adhere to one of the two work practices previously discussed (for

impoundments constructed after December 15, 1989). Within these limits, tailings impoundment technologies have had no fundamental changes.

5.1.5 Radon Measurement Methods

As previously described, Subpart W defines two separate standards. The first states that existing sources (as of December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA that shows the results of the compliance monitoring (see Section 3.5). As pointed out in Appendix B, the focus of the monitoring was on the beaches, tops, and sides of conventional piles. The radon flux from the water-covered portion of the tailings pile was assumed to be zero. Although regulated under Subpart W, it is unclear how to monitor the radon flux off the surface of evaporation ponds at conventional mills, ISLs, or heap leach facilities. Since these ponds are considerably smaller than tailings impoundments, the solution was to specify that as long as the water cover is 1 meter or more during the active life of the pond, no monitoring is necessary (see Section 3.3.1).

Section 3.3.1 also shows that, for evaporation ponds at ISL facilities, the radon flux from the surface is a function of the wind speed and the concentration of radium in the water. Estimates using actual ISL data showed the contribution to the sites' total radon release to be less than 1% of the total. In any case, the radon flux can also be reduced by co-precipitating the radium using barium chloride ($BaCl_2$) co-precipitation treatment to reduce the radium concentration.

For impoundments constructed on or after December 15, 1989, monitoring is not required. Rather, Subpart W requires that these impoundments comply with one of two work practice standards: the first practice limits the size of the impoundment to 40 acres or less, which limits the radon source, while the second practice of continuous disposal does not allow uncovered tailings to accumulate in large quantities, which also limits radon emissions.

For evaporation ponds or holding ponds as in the pre-December 15, 1989, case, a 1-meter cover of water should be sufficient to limit the radon flux to the atmosphere (see Section 3.3.1). Thus, the proposed GACT is that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size or area restriction, and that during the active life of the pond at least 1 meter of liquid be maintained in the pond.

The last facility is the potential heap leach pile. Subpart W applies to the material in the pile as byproduct material is being generated. Considering a small section of the pile as the leach (acid or base) solubilizes the uranium, the material left is byproduct material. The result is a material similar to tailings and the heap is also wet. It is assumed that if the moisture content is greater than 30%, the heap is not dewatered. As long as the heap is not dewatered, the radon diffusion coefficient is such that minimal radon will escape the heap leach pile.

Heap Leach Radon Flux

A possible source of radon from a heap leach pile is from the surface of the pile. Assuming that the heap pile is more than 1 or 2 meters thick, the radon flux from this configuration can be estimated from the following formula (NRC 1984):

$$J = 10^4 R \rho E \sqrt{\lambda D_e} \qquad (5\text{-}1)$$

Where

J = radon flux (pCi/(m^2-sec))

10^4 = units conversion (cm^2/m^2)

R = specific activity of radium (pCi/g)

ρ = dry bulk density of material (1.8 g/cc)

E = emanation coefficient

λ = radon decay constant (2.11×10^{-6} sec^{-1})

D_e = radon diffusion coefficient (cm^2/sec)

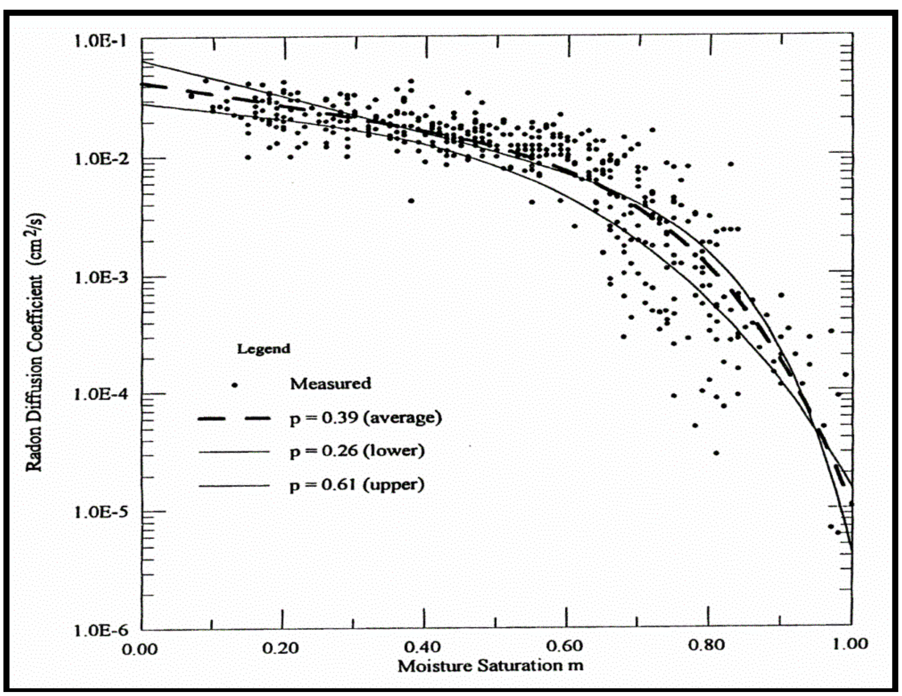
$$= D_0\, p \exp[-6\, m\, p - 6\, m^{14\, p}] \qquad (5\text{-}2)$$

D_0 = radon diffusion coefficient in air (0.11 cm^2/sec)

m = moisture saturation fraction

p = total porosity

The above empirical expression for the radon diffusion coefficient was developed by Rogers and Nielson (1991), based on 1,073 diffusion coefficient measurements on natural soils. Figure 13 shows that the diffusion coefficient calculated using the empirical expression agrees well with the measured data points over the whole range of moisture saturation at which diffusion coefficient measurements were made.



Source: Rogers and Nielson 1991, as reported in Li and Chen 1994

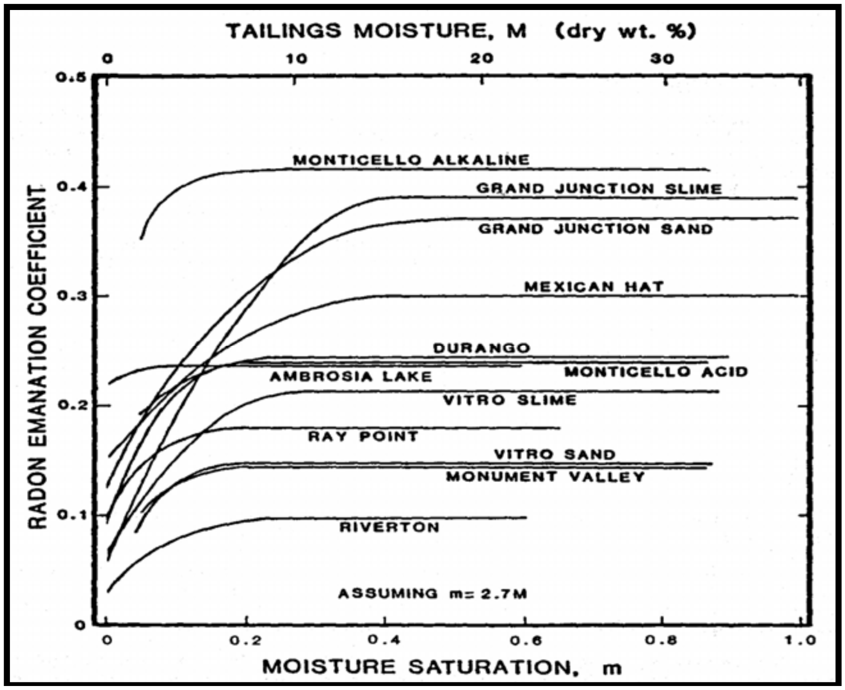
Figure 13: Diffusion Coefficient as a Function of Moisture Saturation

Figure 13 also demonstrates that as the moisture increases, the radon diffusion coefficient decreases significantly. This is because radon diffuses 10,000 times more slowly in water than it does in air (Drago 1998, as reported in Brown 2010). Therefore, adding moisture to the radium-containing material (whether it be a tailings pile or a heap pile) would decrease the diffusion coefficient, thereby increasing the time it takes for radon to diffuse out of the material and allowing more radon to decay before it can be released. As Figure 13 shows, the decrease in the radon diffusion coefficient can be significant, especially at high moisture levels.

However, in addition to the radon diffusion coefficient, the radon emanation coefficient is sensitive to the amount of moisture present. When a radium atom decays, one of three things can happen to the resulting radon atom: (1) it may travel a short distance and remain embedded in the same grain, (2) it can travel across a pore space and become embedded in an adjacent grain, or (3) it is released into a pore space. The fraction of radon atoms released into the pore space is termed the "radon emanation coefficient" (Schumann 1993). As soil moisture increases, it affects the emanation coefficient by surrounding the soil grains with a thin film of water, which slows radon atoms as they are ejected from the soil grain, increasing the likelihood that the radon atom will remain in the pore space. Research by Sun and Furbish (1995) describes this relationship between moisture saturation and the radon emanation rate:

> *The greater the moisture saturation is, the greater the possible radon emanation rate is. With moisture contents from 10% up to 30%, the recoil emanation rates quickly reach the emanation rate of the saturated condition. As the moisture reaches 30%, a universal thin film on the pore surface is formed. This thin film is sufficient to stop the recoil radon from embedding into another part of the pore wall.*

Figure 14 shows that the radon emanation coefficient can vary considerably for different tailings piles. Figure 14 also agrees with Sun and Furbish (1995) in that it shows that the emanation coefficient tends to level off when the moisture saturation level is above approximately 30%.



Source: NRC 1984

Figure 14: Emanation Coefficient as a Function of Moisture Content and Moisture Saturation

In conclusion, a moisture saturation level of up to about 30% tends to increase the radon emanation coefficient and decrease the radon diffusion coefficient, such that the amount of radon released from the pile could increase with increasing moisture. Above about 30% moisture saturation, the radon emanation coefficient is unchanged by increasing moisture, while the radon diffusion coefficient continues to decrease. Figure 15 shows the total effect of moisture on the radon flux. Equation 5-1 was used to develop Figure 15, along with the Rogers and Nielson (1991) empirical equation for the diffusion coefficient, an approximation of the Vitro Sand emanation coefficient from Figure 14, and a porosity of 0.39. Figure 15 does not show the radon flux values, since they would vary depending on the radium concentration and would not affect the shape of the curve.

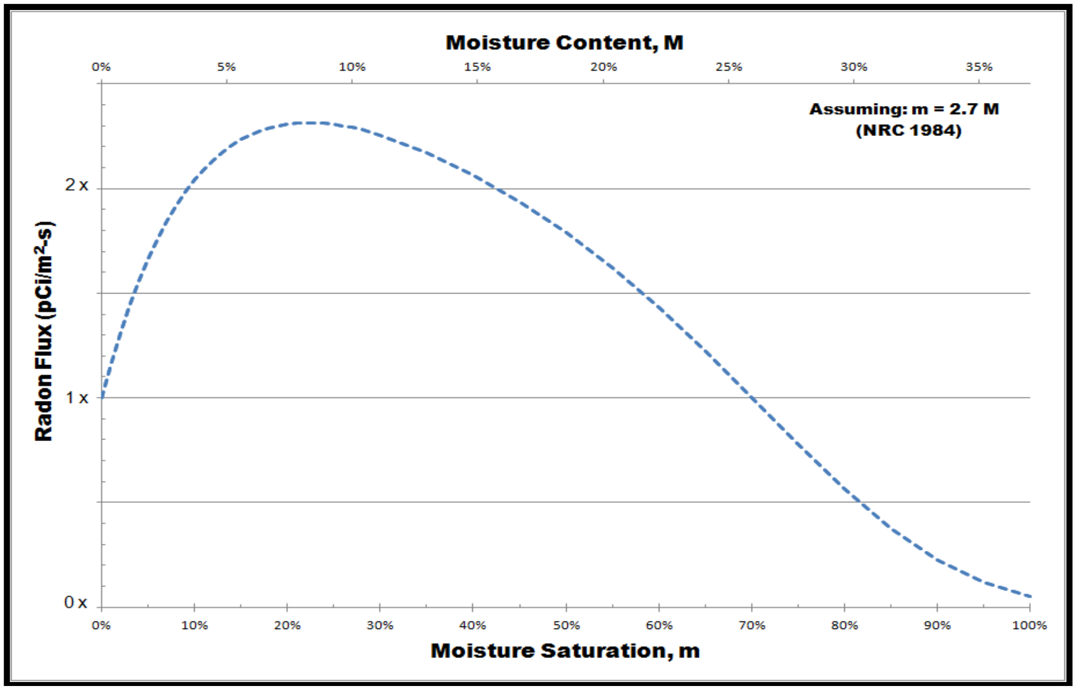


Figure 15: Radon Flux as a Function of Moisture Saturation and Moisture Content

Figure 15 shows that the radon flux starts low and increases as the moisture saturation increases due to the emanation coefficient. At between 20% and 30% moisture saturation, the flux reaches a peak that is about 2½ times the flux at zero moisture, after which the diffusion coefficient takes control and the flux decreases. Figure 15 is consistent with the results reported by Hosoda et al. (2007) in their study of the effect of moisture on the emanation of radon and thoron gases from weathered granite soil:

> *A sporadic increase in the radon and thoron exhalation rates was caused by the increase in the moisture content up to 8%* [27% moisture saturation]. *However, the exhalation rates showed a decreasing tendency with the increase in moisture content over 8%…, both measured and calculated radon exhalation rates had similar trends with an increase in the moisture content in the soil.*

The final point from Figure 15 is that the radon flux with a moisture content of 70% or greater is less than the flux at zero moisture, and that with a porosity of 0.39, 70% moisture saturation is equivalent to 27% moisture by weight. Thus, 30% moisture by weight would result in a radon flux significantly below the zero moisture flux.

5.1.6 Risk Assessment

Section 4.4 presents the results of a risk assessment performed for seven actual uranium recovery sites plus two generic uranium recovery sites. This risk assessment used the CAP88 Version 3.0 analytical computer model, which, as described in Section 4.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Additionally, this assessment used the latest radon dose and risk coefficients (i.e., millirem

(mrem)/picocurie (pCi) and LCF/pCi) from FGR 13. Both the 1989 assessment and this assessment used site-specific meteorological data. This assessment used 2000 census data, updated to 2010, whereas the 1989 assessment used 1983 data. Finally, as stated above, this assessment used actual historical radon releases from the uranium recovery sites, whereas because of the lack of site-specific data, the 1989 assessment assumed a radon release rate based on 1 pCi/(m^2-sec) Rn-222 emitted per pCi/g Ra-226 during both the operating, standby, drying, and/or disposal phase, and either 20 pCi/(m^2-sec) or the design flux (if known) during the post-disposal phase.

Section 4.4 presents the doses and risks calculated by the current risk assessment, and Section 4.5summarizes them. Additional information on the current risk assessment appears in SC&A 2011.

5.2 Uranium Recovery Source Categories

The preceding items and key issues are the basis for categorizing the major uranium recovery methods that will lead to methods of reducing radon emissions. The next section, which addresses the GACT standard, further discusses the applicability of the control measures. The following source categories represent a logical breakdown of the current uranium recovery industry:

Conventional Impoundments – Conventional impoundments are engineered structures for storage and eventual permanent disposal of the fine-grained waste from mining and milling operations (i.e., tailings). All conventional uranium recovery mills have one or more conventional impoundments. Table 3 shows conventional uranium milling facilities that are either built or licensed. This category will also include future conventional milling facilities.

Nonconventional Impoundments – At nonconventional tailings impoundments, tailings (byproduct material) are contained in ponds and covered by liquids. These impoundments are normally called “evaporation ponds” or “holding ponds.” Nonetheless, they contain byproduct material and, as shown in Section 3.3.1, can generate radon gas. This category is usually associated with ISL facilities (i.e., process waste water resulting from ISL operations (see Section 3.3)), but can also be associated with conventional facilities or heap leach facilities. While these ponds do not meet the work practices for conventional mills, they still must meet the requirements of 40 CFR 192.32(a)(1).

Heap Leach Piles – While no heap leach facilities are currently operating in the United States, at least one potential operation is expected to go forward (see Section 3.4). Heap leach piles contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct. As stated above, the design and operation of the heap leach is expected to follow the requirements of 40 CFR 192.32(a)(1).

5.3 The GACT Standard

Section 112(d) of the CAA requires EPA to establish NESHAPs for both major and area sources of HAPs that are listed for regulation under CAA section 112(c). Section 112(c) lists

radionuclides, including radon, as a HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for regulation of emissions of HAP. A "major source," other than for radionuclides, is defined as any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, in the aggregate, 10 tons per year or more of any HAP. For radionuclides, major source shall have the meaning specified by the Administrator by rule. An area source is a stationary source that is not a major source.

The regulation of HAPs at major sources is dictated by the use of MACT. Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating a MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

In 2000, EPA provided guidance to clarify how to apply the major source threshold for HAPs as defined in section 112(b) of the CAA Amendments of 1990. The guidance stated how to apply the major source threshold specifically for radionuclides:

> *There have been some questions about determining the major source threshold for sources of radionuclides. Section 112(a)(1) allows the Administrator to establish different criteria for determining what constitutes a major source of radionuclides since radionuclides emissions are not measured in units of tons. This, however, would not preclude a known radionuclide emitter that is collocated with other HAP-emitting activities at a plant site from being considered a major source due to the more common, weight-based threshold. The July 16, 1992, source category list notice did not include any sources of radionuclides because no source met the weight-based major source threshold, and the Agency had not defined different criteria. At the current time, there remain no listed major source categories of radionuclide emissions.* [EPA 2000b]

Based on this guidance, radon emissions from uranium recovery facility tailings impoundments are not a major source, and therefore, they are area sources for which the GACT standard is applicable. Unlike MACT, the meaning of GACT, or what is "generally available" is not defined in the act. However, section 112(d)(5) of the CAA Amendments for 1990 authorizes EPA to:

> *Promulgate standards or requirements applicable to [area] sources…which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.*

The Senate report on the legislation (U.S. Senate 1989) provides additional information on GACT and describes it as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic*

impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. Also considered are the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are also reviewed to determine whether such technologies and practices can be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

Thus, as presented above, “Promulgate standards or requirements … ” does not limit EPA to strict “standard setting” in order to provide for the use of GACT. Rather, it allows EPA to promulgate at least two types of rules: rules that set emission levels based on specific controls or management practices (this is analogous to the MACT standard setting), and rules that establish permitting or other regulatory processes that result in the identification and application of GACT standards.

5.4 Uranium Recovery Categories and GACT

For conventional impoundments, the 1989 promulgation of Subpart W contained two work practice standards, phased disposal and continuous disposal (see Section 2.0, page 7). The work practice standards limit the size and number of the impoundments at a uranium recovery facility in order to limit radon emissions. The standards cannot be applied to a single pile that is larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). This approach was taken in recognition that the radon emissions from these impoundments could be greater if the piles were left dry and uncovered. The 1989 Subpart W also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for preventing and mitigating ground water contamination.

As discussed earlier, it is no longer believed that a distinction needs to be made for conventional impoundments based on the date when they were design and/or constructed. The existing impoundments at both the Shootaring Canyon (Section 3.2.3) and Sweetwater (Section 3.2.1) facilities can meet the work practice standards in the current Subpart W regulation. Impoundments at both these facilities have an area of less than 40 acres and are synthetically lined as required in 40 CFR 192.32(a). Also, the existing Cell 3 at the White Mesa mill will be closed in 2012 and replaced with impoundments that meet the phased disposal work practice standard (Section 3.2.2). Therefore, there is no reason not to apply the work practice standards required for impoundments designed or constructed after December 15, 1989, to these older impoundments. By incorporating these impoundments under the work practice standards, the requirement of radon flux testing is no longer needed and will be eliminated.

For the proposed GACT, the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards were evaluated. Liner requirements in use for the permitting of hazardous waste land disposal units under RCRA are contained in 40 CFR 264.221. Since 40 CFR 192.32(a)(1) references 40 CFR 264.221, it is the only requirement necessary for Subpart W, as the RCRA requirements are effective methods of containing tailings and protecting ground water while also limiting radon emissions. The regulation in 40 CFR 264.221 contains safeguards to allow for the placement of tailings and also provides for an early warning system in the event of a leak in the liner system. Therefore, the proposed GACT for conventional impoundments retains the two work practice standards and the requirements of 40 CFR 192.32(a)(1), because they have proven to be effective methods for limiting radon emissions while also protecting ground water. The NRC considers the requirements of 40 CFR 192.32(a) in its review during the licensing process.

For nonconventional impoundments, where tailings (byproduct material) are contained in ponds and covered by liquids, a new GACT is proposed. These facilities, called "evaporation ponds" or "holding ponds," also must meet the requirements of 40 CFR 192.32(a)(1). Specifically, these are the design and operating requirements for the impoundments. Because of the general experience that a depth of greater than 1 meter of liquid essentially reduces the radon flux of ponds to negligible levels, no monitoring is required for this type of impoundment. Given these factors, the following GACT is proposed:

> Nonconventional impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

For the last category, heap leach piles, an approach similar to that for nonconventional impoundments is proposed. As previously noted, these facilities contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct material, which is regulated under Subpart W. As for nonconventional impoundments, the design and operation of the heap leach pile is expected to follow the requirements of 40 CFR 192.32(a)(1). This also will prevent the loss of pregnant liquor (lixiviant with dissolved uranium) from spillage or leakage.

The byproduct material that makes up the volume of the spent heap leach pile is typically wet. As Figure 15 shows, as material goes from dry to wet the radon flux first increases before it decreases (the reasons for this are discussed in Section 5.1.5). While it is impossible to maintain a completely wet state, it is possible to maintain a sufficient percentage of moisture content to meet a goal that the radon flux in the wetted material is below what the flux would be if the material was dry. This percentage is related to the state or material being "dewatered." By way of definition, 40 CFR 61.251(c) states:

> Dewatered *means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight.*

Thus, the proposed GACT for heap leach piles is that, in addition to meeting 40 CFR 192.32(a)(1), operating heap leach piles must maintain a moisture content greater than

30% (equivalent to about 70% to 80% moisture saturation, as described in Section 5.1.5). This would, as indicated, ensure that the radon flux from the surface of the pile is quite low, i.e., at or below what the flux would be if the material in the pile was dry.

Since the purpose of this GACT is to control the radon emissions, it may not be critical to maintain the 30% moisture content in the lower levels/lifts of the pile. The reason for this is two-fold; first, radon generated in the lower levels would have to travel further in the pile before it would escape to the atmosphere, thereby giving it more time to decay within the pile, and second, radon from the lower layers will be slowed due to the 30% moisture content in the upper levels. Additionally, if inter-lift liners are provided when the pile is composed of multiple lifts, the inter-lift liner would act as a barrier to radon from the lower lifts, and thus mitigate the need for those lower lifts to maintain the 30% moisture content. On the other hand, because radon emission do not stop when active uranium leaching has ceased, it will be necessary to continue wetting the pile to maintain the 30% moisture content until a final reclamation cover (including a radon barrier layer) has been constructed over the pile.

5.5 Other Issues

During the review of Subpart W, several additional issues were identified. These are identified and discussed in this section.

5.5.1 Extending Monitoring Requirements

In reviewing Subpart W, EPA examined whether radon monitoring should be extended to all impoundments constructed and operated since 1989 so that the monitoring requirement would apply to all impoundments containing uranium byproduct material (i.e., tailings). EPA also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. As the rule currently exists, only pre-1989 conventional tailings impoundments are required to monitor for radon emissions, the requirement being an average flux rate of not more than 20 pCi/(m^2-sec). This is because, at the time of promulgation of the 1989 rule, EPA stated that the proposed work practice standards would be effective in reducing radon emissions from operating impoundments. Since the work practice standards could not be applied to pre-1989 facilities, and since EPA determined that it is not feasible to prescribe an emissions standard for radon emissions from a tailings impoundment (54 FR 9644 (FR 1989a)), the improved work practice standards would limit radon emissions by limiting the amount of tailings exposed.

Thus, it is not necessary to require radon monitoring at facilities constructed after the current Subpart W was promulgated (i.e., December 15, 1989). With respect to tailings and the amount of water used to cover them, the work practice standards (now proposed as GACTs) are also protective in preventing excess radon emissions. Further, for nonconventional impoundments, where there is no applicable radon monitoring method, the standing liquid requirement will effectively prevent all radon emissions from holding or evaporation ponds.

5.5.2 Clarification of the Term "Operation"

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement [which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W]. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

> <u>Operation.</u> Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

5.5.3 Clarification of the Term "Standby"

In the past, there has been confusion as to whether the requirements of Subpart W apply to a uranium recovery facility that is in "standby" mode. Although not formally defined in Subpart W, "standby" is commonly taken to be the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations. This period usually takes place when the price of uranium is such that it may not be cost effective for the facility to continue operations, and yet the facility fully intends to operate once the price of uranium rises to a point where it is cost effective for the facility to re-establish operations. As shown in Table 3, the Sweetwater and Shootaring Canyon mills are currently in standby. While in standby, a uranium recovery facility can change its license from an operating license to a possession only license, thereby reducing its regulatory obligations (and costs).

The addition of the following definition of "closure" into the Subpart W definitions at 40 CFR 61.251 would eliminate confusion:

> <u>Standby</u>. Standby means the period of time that a facility may not be accepting new tailings, but has not yet entered closure operations.

5.5.4 The Role of Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these western regions, the annual average precipitation (see Figure 16) falling on the impoundment is less than the annual average evaporation (see Figure 17) from the impoundment. Also, these facilities are located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. However, recent uranium exploration in the United States shows the potential to move eastward, into more climatologically temperate regions of the country. South central Virginia is now being considered for a conventional uranium mill (e.g., the Coles Hills, see Table 4). To determine whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

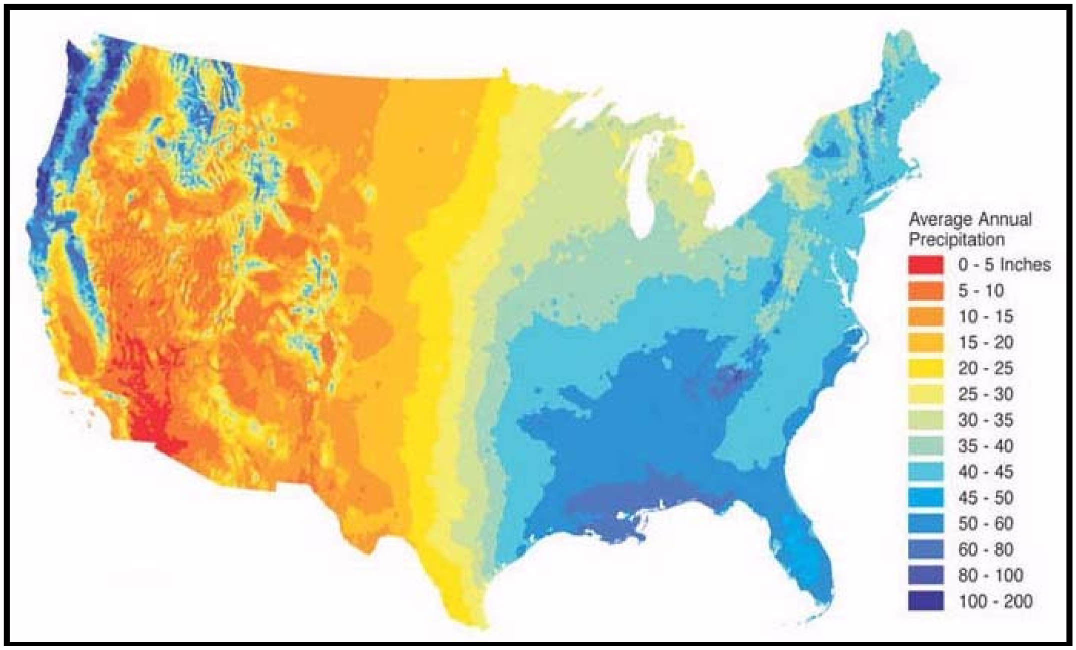


Figure 16: U.S. Average Annual Precipitation

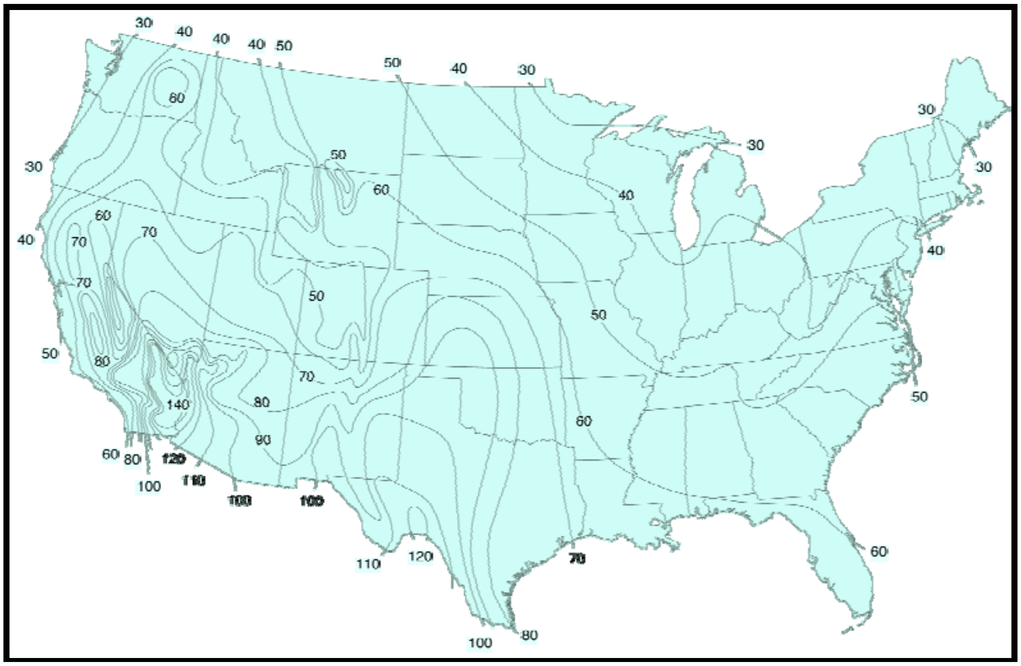


Figure 17: U.S. Mean Annual Evaporation

Subpart W requires owners and operators of uranium tailings impoundments to follow the requirements of 40 CFR 192.32(a). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that can be used to ensure proper operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action; rainfall; run-on; malfunctions of level controllers, alarms and other equipment; or human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive dike failure. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Uranium recovery facilities are already operating under the requirements of 40 CFR 192.32(a)(1), including compliance with 40 CFR 264.221(g) and (h), which will provide protection against the weather events likely to occur in the eastern United States.

6.0 ECONOMIC IMPACTS ASSOCIATED WITH REVISION/MODIFICATION OF THE SUBPART W STANDARD

This section contains the following economic impact analyses necessary to support any potential revision of the Subpart W NESHAP:

- Section 6.1 provides a review and summary of the original 1989 economic assessment and supporting documents.
- The baseline economic costs for development of new conventional mills and ISL and

heap leach facilities are developed and presented in Section 6.2.

- Section 6.3 presents the anticipated industry costs versus environmental and public health benefits to be derived from each of the four proposed GACT standards.

- Finally, Section 6.4 provides demographic data regarding the racial and socioeconomic composition of the populations surrounding uranium recovery facilities.

To assess the economic impacts of potential revisions to the Subpart W NESHAP, capital costs (including equipment costs), labor costs, taxes, etc., were obtained from actual recent cost estimates that have been prepared for companies planning to design, develop, construct, and operate uranium recovery facilities. For ISL facilities, two recent cost estimates were used as the basis for this analysis, while for conventional mills and heap leach facilities, a single cost estimate was used for each type of facility. Other necessary data, such as a discount rate, borrowing, and interest rates, were assumed, as described in Section 6.2.

Where feasible and appropriate, the economic models and recommendations from EPA's "Guidelines for Preparing Economic Analyses" (EPA 2010) were followed in assessing these economic impacts.

The cost and economic impact estimates described in Section 6.2 and 6.3 are based on industry data compiled in 2010-2011. Therefore, some of the analytical input values would differ somewhat if they were updated to reflect the latest information available. For example, the current long-term market price of uranium is approximately 17 percent lower than the $65 estimate that is used in the analysis (Cameco, 2013). The uranium mining industry is currently experiencing a volatile period resulting from the aftereffects of the Fukushima nuclear disaster. In particular, uranium demand has suffered from nearly all of Japan's workable reactors remaining offline since the March 2011 earthquake and tsunami triggered multiple meltdowns at the Fukushima Dai-ichi plant. Given the atypical post-Fukushima uranium market situation of the last couple of years and the prospects for a return to more normal market activity in the mid-term future,[7] we have decided not to update the analysis to incorporate the latest industry data. The results of the analyses described in this section are judged to be realistic estimates of the mid- to long-term impacts of the proposed Subpart W NESHAP.

6.1 1989 Economic Assessment

When Subpart W was promulgated in 1989, EPA performed both an analysis of the standard's benefits and cost and an evaluation of its economic impacts. Those analyses appear in the 1989 BID, Volume 3, Sections 4.4 and 4.5 (EPA 1989). This section briefly summarizes the Subpart W economic assessments performed in 1989.

[7]These prospects include: the conclusion of the U.S.-Russia program that annually removes 24 million pounds of ex-military highly enriched uranium from the market via down-blending for use as U.S. nuclear fuel; the 60 nuclear power plants that are currently under construction throughout the world; efforts to reduce climate change emissions; and expectations that Japan will slowly begin restarting its 50 nuclear plants.

In these 1989 assessments, EPA evaluated the benefits and costs associated with three separate decisions. The first decision concerned a limit on allowable radon emissions after closure. The options evaluated included reducing radon emissions from the 20 pCi/(m^2-sec) limit to 6 pCi/(m^2-sec) and 2 pCi/(m^2-sec).

The second decision that EPA investigated was the means by which the emissions from active mills could be reduced to the 20 pCi/(m^2-sec) limit while operations continue. Emissions could be reduced by applying earth and water covers to portions of the dry areas of the tailings piles, which could reduce average radon emissions for the entire site to the 20 pCi/(m^2-sec) limit.

While the first two decisions were focused on tailings piles that existed at the time the standard was promulgated, the third concerned future tailings impoundments. EPA evaluated alternative work practices for the control of radon emissions from operating mills in the future. Options investigated include the replacement of the traditional single-cell impoundment (i.e., the 1989 baseline) with phased disposal or continuous disposal impoundments.

6.1.1 Reducing Post-Closure Radon Emissions from 20 pCi/(m^2-sec)

The 1989 BID estimated the total annual tailings piles radon emissions for standards of 20, 6, and 2 pCi/(m^2-sec) and calculated the cancers that could result from those emissions. It found that over a 100-year analysis period, the 6 pCi/(m^2-sec) option could lower local and regional risks by 3.6 cancers, while the incremental benefit of lowering the allowable flux rate from 6 to 2 pCi/(m^2-sec) was estimated at 1.0 cancer.

The increased costs associated with reducing the allowable flux rate from 20 to 6 pCi/(m^2-sec) were estimated to be between $113 and $180 million (1988$) ($205 and $327 million (2011$)), while attainment of a 2 pCi/(m^2-sec) flux rate was estimated to result in added costs of $216 to $345 million (1988$) ($393 to $627 million (2011$)).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. As the following excerpt from the preamble to the standard shows, for tailings piles at operating mills, EPA's decision was based on the very low risks associated with 20 pCi/(m^2-sec), rather than on a comparison of the benefits versus the costs of the alternative emission standards:

> *... the risks from current emissions are very low. A NESHAP requiring that emissions from operating mill tailings piles limit their emissions to no more than 20 pCi/(m^2-sec) represents current emissions. EPA has determined that the risks are low enough that it is unnecessary to reduce the already low risks from the tailings piles further.* [FR 1989a, page 51680]

While for tailings impoundments at inactive mills, the preamble presented a quantitative cost-benefit comparison as justification for maintaining the radon emission level at 20 pCi/(m^2-sec):

> *EPA examined these small reductions in incidence and maximum individual risk and the relatively large costs of achieving Alternative II* [6 pCi/(m^2-s)]*, $158 million capital coat and $33 million in annualized costs and determined that Alternative I* [20 pCi/(m^2-s)] *protects public health with an ample margin of safety.* [FR 1989a, page 51682]

6.1.2 Reducing Radon Emissions During Operation of Existing Mills

The 1989 BID estimated the reduction in total risk that could be obtained by reducing radon emissions from active mills operating at that time to 20 pCi/(m^2-sec) through the application of an earthen cover and/or by keeping the tailings wet. The 1989 BID, Table 4-41, reported the risk reduction to be 0.17 fatal cancers for all active mills over their assumed 15-year operational life.

The 1989 BID, Table 4-42B, reported that the cost for providing the earthen covers and for keeping the tailings wet over the 15-year operating period was estimated to be $13.166 million (1988$) ($23.94 million in 2011$).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. EPA nonetheless decided that without these standards the risks were too high, as the following segment from the preamble to the standard indicates:

> *… EPA recognizes that the risks from mill tailings piles can increase dramatically if they are allowed to dry and remain uncovered. An example of how high the risks can rise if the piles are dry and uncovered can be seen in the proposed rule, 54 FR 9645. That analysis assumed that the piles were dry and uncovered and the risks were as high as* 3×10^{-2} *with 1.6 fatal cancers per year. Therefore, EPA is promulgating a standard that will limit radon emissions to an average of 20 pCi/m^2-s. This rule will have the practical effect of requiring the mill operators to keep their piles wet or covered. …* [FR 1989a, page 51680]

6.1.3 Promulgating a Work Practice Standard for Future Tailings Impoundments

Section 4.4.3.1 of the 1989 BID provides the following explanations of the phased and continuous disposal options:

> ***Phased Disposal***
>
> *The first alternative work practice which is evaluated for model new tailings impoundments is phased disposal. In phased or multiple cell disposal, the tailings impoundment area is partitioned into cells which are used independently of other cells. After a cell has been filled, it can be dewatered and covered, and another cell used. Tailings are pumped to one initial cell until it is full. Tailings are then pumped to a newly constructed second cell and the former cell is dewatered and then left to dry. After the first cell dries, it is covered with earth obtained from the construction of a third cell. This process is continued sequentially. This system*

> *minimizes emissions at any given time since a cell can be covered after use without interfering with operations as opposed to the case of a single cell.*
>
> *Phased disposal is effective in reducing radon-222 emissions since tailings are initially covered with water and finally with earth. Only during a drying-out period of about 5 years for each cell are there any* [significant] *radon-222 emissions from the relatively small area. During mill standby periods, a water cover could be maintained on the operational cell. For extended standby periods, the cell could be dewatered and a dirt cover applied.*
>
> ***Continuous Disposal***
>
> *The second alternative work practice, continuous disposal, is based on the fact that water can be removed from the tailings slurry prior to disposal. The relatively dry dewatered (25 to 30% moisture* [by weight]*) tailings can then be dumped and covered with soil almost immediately. No extended drying phase is required, and therefore very little additional work would be required during final closure. Additionally, ground water problems are minimized.*
>
> *To implement a dewatering system would introduce complications in terms of planning, design, and modification of current designs. Acid-based leaching processes do not generally recycle water, and additional holding ponds with ancillary piping and pumping systems would be required to handle the liquid removed from the tailings. Using trucks or conveyor systems to transport the tailings to disposal areas might also be more costly than slurry pumping. Thus, although tailings are more easily managed after dewatering, this practice would have to be carefully considered on a site-specific basis.*
>
> *Various filtering systems such as rotary vacuum and belt filters are available and could be adapted to a tailings dewatering system. Experimental studies would probably be required for a specific ore to determine the filter media and dewatering properties of the sand and slime fractions. Modifications to the typical mill ore grinding circuit may be required to allow efficient dewatering and to prevent filter plugging or blinding. Corrosion-resistant materials would be required in any tailings dewatering system due to the highly corrosive solutions which must be handled. …*

The committed fatal cancer risk[8] from the operation of model baseline (single-cell), phased disposal, and continuous disposal impoundments, as determined by the 1989 BID, is shown in Table 17. Table 17 shows the following:

> [during] *the operational period the risk of cancer is reduced, relative to the single cell baseline, by 0.129 if phased disposal is adopted and by 0.195 if the continuous single cell method is used. The risk reduction associated with using the continuous single cell relative to the phased approach is 0.066. In the post-operational phase, phased disposal raises the risk by 0.012 relative to the*

---

[8] "Committed fatal cancer risk" is the likeliness that an individual will develop and die from cancer at some time in the future due to their current exposure to radiation. "Committed fatal cancer risk" is sometimes referred to as "latent cancer fatality risk."

baseline, while the continuous single cell approach lowers it by 0.017 relative to the baseline and by 0.028 relative to phased disposal. [EPA 1989, Section 4.4.3.3]

Table 17: Radon Risk Resulting from Alternative Work Practices (Committed Cancers)

	Baseline (Single Cell)	Phased Disposal	Continuous Disposal
Operational Period (0 to 20 years)	0.282	0.153	0.087
Post-Operations (21 to 100 years)	0.264	0.276	0.247
Total	0.546	0.429	0.334

Source: EPA 1989, Table 4-45

Concerning the cost to implement the work practices, the 1989 BID indicates the following:

the phased … disposal impoundment is the most expensive design ($54.02 million [1988$]*), while the single cell … impoundment ($36.55 million* [1988$]*) is the least expensive. Costs for the continuous single cell design ($40.82 million* [1988$]*) are only slightly more than those of the single cell impoundment, although the uncertainties surrounding the technology used in this design are the largest*. [EPA 1989, Section 4.4.3.4]

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. However, as the following excerpt from the preamble to the standard shows, EPA was concerned about the uncertainty of the benefits and costs analysis that had been performed for this portion of the regulation. Ultimately, the Agency based its decision on the small cost to implement the work practices, rather than on weighing the benefits versus the costs:

The uncertainty arises because it assumes a steady state industry over time. If the uranium market once again booms there would be increased risks associated with Alternative I [one large impoundment (i.e., baseline)]. *If the industry then experienced another economic downturn, the costs of Alternative I would increase because of the economic waste that occurs when a large impoundment is constructed and not filled. The risks can also increase if a company goes bankrupt and cannot afford the increased costs of closing a large impoundment and the pile sits uncovered emitting radon. The risks can also increase if many new piles are constructed, creating the potential for the population and individual risks to be higher than EPA has calculated.*

These uncertainties significantly affect the accuracy of the [benefits and costs] *analysis and given the small cost of going to Alternatives II* [phased disposal] *and III* [continuous disposal]*, EPA has determined that in order to protect the public*

with an ample margin of safety, both now and in the future, new mill tailings impoundments must use phased or continuous disposal. [FR 1989a, page 51680]

6.1.4 Economic Impacts

To determine the economic impacts of the proposed Subpart W on the uranium production industry, the 1989 BID evaluated two extreme cases; in the first, it was assumed that "no portion of the cost of the regulation can be passed on to the purchaser of U_3O_8," and in the second, it was "assumed that the uranium production industry is able to recover the entire increase in the tailings disposal cost by charging higher U_3O_8 prices." These two cases provided the lower and upper bound, respectively, of the likely economic impacts of Subpart W on the uranium production industry.

As described in Section 3.1, from 1982 to 1986, the uranium production industry had been contracting and experiencing substantial losses because of excess production capacity. The 1989 Subpart W economic impact assessment concluded that if the industry had to absorb the costs of implementing the regulation, the present value cost at that time would be about five times the industry losses from 1982 to 1986, or equal to about 10% of the book value of industry assets at that time, or about 15% of industry's liabilities.

Alternatively, if the uranium production industry could pass on the Subpart W implementation costs to its electric power industry customers, who would likely pass on the costs to the electricity users, the 1989 economic impact assessment concluded:

> *The revenue earned by the* [electric power] *industry for generating 2.4 trillion kilowatt hours of electricity in 1986 was 121.40 billion dollars. The 1987 present value of the regulation (estimated to be $250 million) is less than 1 percent (.06%) of the U.S. total electric power revenue for the same year.* [EPA 1989, Section 4.5.1]

The 1989 BID drew no conclusions regarding what effects, if any, these impacts would have on the uranium production industry's financial health.

6.2 U_3O_8 Recovery Baseline Economics

This section presents the baseline economics for development of new conventional mills, ISL facilities, and heap leach facilities. EPA's economic assessment guidelines define the baseline economics as "a reference point that reflects the world without the proposed [or in the case of Subpart W, the modified] regulation. It is the starting point for conducting an economic analysis of potential benefits and costs of a proposed [or modified] regulation" (EPA 2010, Section 5).

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the conventional mill, data from the proposed new mill at the Piñon Ridge project in Colorado were used. For the ISL facility, data from two proposed new facilities were used: the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production

period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Sections 6.2.1 through 6.2.4 provide details of how the project-specific cost data were converted into base case economic data, and Section 6.2.5 presents a short sensitivity study for the conventional mill and heap leach cost estimates. Because two projects were analyzed, a sensitivity analysis of the ISL cost estimates was not performed.

Next it was necessary to estimate the annual amount of U_3O_8 that is currently used and how much would be required in the future. For these estimates, data from the Energy Information Administration (EIA) were used. Section 6.2.6 describes how the EIA data were coupled with specific cost data for the uranium recovery facilities to determine the cost and revenue estimates provided in Table 18.

Table 18: Uranium Recovery Baseline Economics (Nondiscounted)

Cost / Revenue	2009 ($1,000)		2035 Projections ($1,000)*			
	2009$	2011$	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$347,000	$462,000	$502,000	$473,000	$605,000	$706,000
U_3O_8 Cost	$298,000	$372,000				
Conventional			$398,000	$375,000	$480,000	$560,000
In-Situ Leach			$396,000	$373,000	$477,000	$557,000
Heap Leach			$356,000	$335,000	$429,000	$501,000
Mixed Facilities			$392,000	$368,000	$472,000	$553,000

* See the discussion below and in Section 6.2.6 for a description of these cases.

Table 18 presents uranium production industry cost and revenue for six cases. The first two cases are based on the actual amount of U_3O_8 produced in the United States in 2009 (the last year for which data are available). The two 2009 cases differ in that the first is based on 2009 dollars, including the weighted-average price of $48.92 per pound for uranium of U.S. origin, while the second was based on assumptions used in this analysis (i.e., 2011 dollars and a U_3O_8 price of $65 per pound). The remaining four cases in Table 26 are all based on the assumptions used in this analysis, but differ in the amount of U_3O_8 assumed to be produced in the United States in 2035. The first through third 2035 cases are for the Reference, Low Nuclear Production, and High Nuclear Production projected 2035 nuclear power usage, as estimated by the EIA (see Section 6.2.6). It should be noted that most of the U_3O_8 used in the United States is from foreign suppliers. The fourth 2035 case (Ref Low Import) increases the percentage of U.S.-origin uranium to 20% for the reference nuclear power usage estimate.

For each of the four 2035 projection cases, four assumptions were made regarding the source of the U_3O_8: (1) all U_3O_8 is from conventional mills, (2) all U_3O_8 is from ISL (recovery) facilities, (3) all U_3O_8 is from heap leach facilities, and (4) the U_3O_8 is from a mixture of uranium recovery facilities (see Section 6.2.6, page 87, for a definition of the mixture). Table 19 shows that the type of uranium recovery facility assumed makes only about a 15% difference between the lowest cost (heap leach) and the largest cost (ISL) recovery type facility.

6.2.1 Conventional Mill Cost Estimate

The base case economic costs for development of a new conventional mill were developed using data from the proposed new mill at Piñon Ridge in Colorado (Edge 2009). Although cost estimates for other conventional mills were reviewed, e.g., Coles Hill (Lyntek 2010), Church Rock (BDC 2011), the Piñon Ridge cost estimate was selected for the base case because it is believed to be the furthest advanced. Specific cost data obtained from the Piñon Ridge project (i.e., Edge 2009, Tables 7.1-1 and 7.1-2) were for land acquisition and facility construction, operating and maintenance, decommissioning, and regulatory oversight. While the Piñon Ridge project supplied the mill design parameters and the overall magnitude of the cost, additional data on the breakdown of the capital and operating costs were taken from the Coles Hill uranium project located in Virginia (Lyntek 2010).

Assumptions used to develop the conventional mill base case cost estimate include:

- As per the Piñon Ridge project, the mill design processing capacity is1,000 tons per day (tpd), and the licensed operating processing rate is 500 tpd.

- The operating duration is 40 years, as per the Piñon Ridge project.

- Because they were more detailed, the Coles Hill cost data (Lyntek 2010) were used to generate a percentage breakdown of the Piñon Ridge cost estimates (Edge 2009). For example, the Piñon Ridge operating cost estimate was divided into labor, power and water, spare parts, office and lab supplies, yellowcake transportation, tailings operating, and general and administration (G&A) using Coles Hill percentages. Thus, the Coles Hill data affected the detailed breakdown of the cost estimate, but not its magnitude.

- Ore grades are 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The base case analysis did not use the Piñon Ridge project's average ore grade of 0.23%.

- The U_3O_8 recovery rate is 96% per the Piñon Ridge project.

- A line of credit (LoC) of $146 million has an annual interest rate of 4%, with a 20-year payback period.

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

The Piñon Ridge project data do not include the costs to develop and/or operate a uranium mine. Rather, it is assumed that these costs are included in the cost of the uranium ore purchased for processing at the Piñon Ridge mill. Mine development and operating costs are included for the conventional mill based on an average of the open pit and underground mine costs developed for the heap leach facility (see Section 6.2.2).

Table 19 presents the cost estimates that were developed for the conventional uranium mill.

Table 19: Conventional Mill Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)	7,000	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	15,958	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$1,037,299	$617,406	$369,925
Line of Credit (LoC)	$146,000	$154,891	$167,155
Mine Costs			
Development	$82,553	$49,136	$29,440
Operating	$261,195	$155,465	$93,148
Mill Costs			
Construction	$134,073	$139,870	$147,761
Mill Direct	$53,136	$55,434	$58,562
Mill Indirect	$9,547	$9,960	$10,522
Mill Contingency	$15,671	$16,348	$17,271
Tailings	$55,718	$58,128	$61,407
Operating and Maintenance	$124,397	$74,042	$44,363
Labor (All inclusive)	$59,267	$35,276	$21,136
Power & Water	$19,400	$11,547	$6,919
Spare Parts	$15,883	$9,454	$5,664
Office and Lab Supplies	$5,117	$3,045	$1,825
Yellowcake Transportation	$2,239	$1,332	$798
Tailings Operating	$22,492	$13,387	$8,021
G&A	$8,634	$5,139	$3,079
Taxes, Claims, and Royalties	$119,289	$71,002	$42,541
Regulatory Oversight	$11,800	$7,191	$4,541
Decommissioning/Closure	$12,000	$3,679	$801
Repay LoC, plus Finance Costs	$214,859	$169,561	$130,302
Total Cost	$968,801	$675,085	$495,978

The cash balance for the conventional mill (as well as the other uranium recovery facilities) is shown in Figure 18. Figure 18 shows that until production year 18, when the LoC has been paid off, the conventional mill is just breaking even.

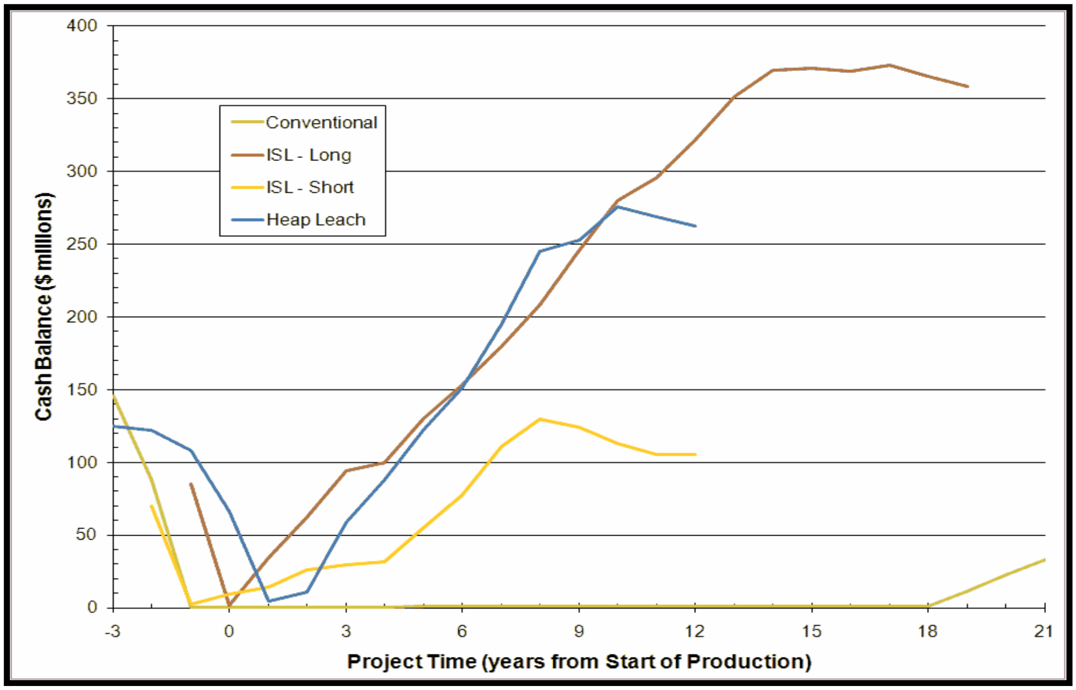


Figure 18: Estimated Cash Balance – Reference Cases

Figure 19 shows the assumed annual U_3O_8 production from the conventional mill (as well as the other uranium recovery facilities). Based on the assumptions used for the base case, the conventional mill produces the least amount of U_3O_8 annually.

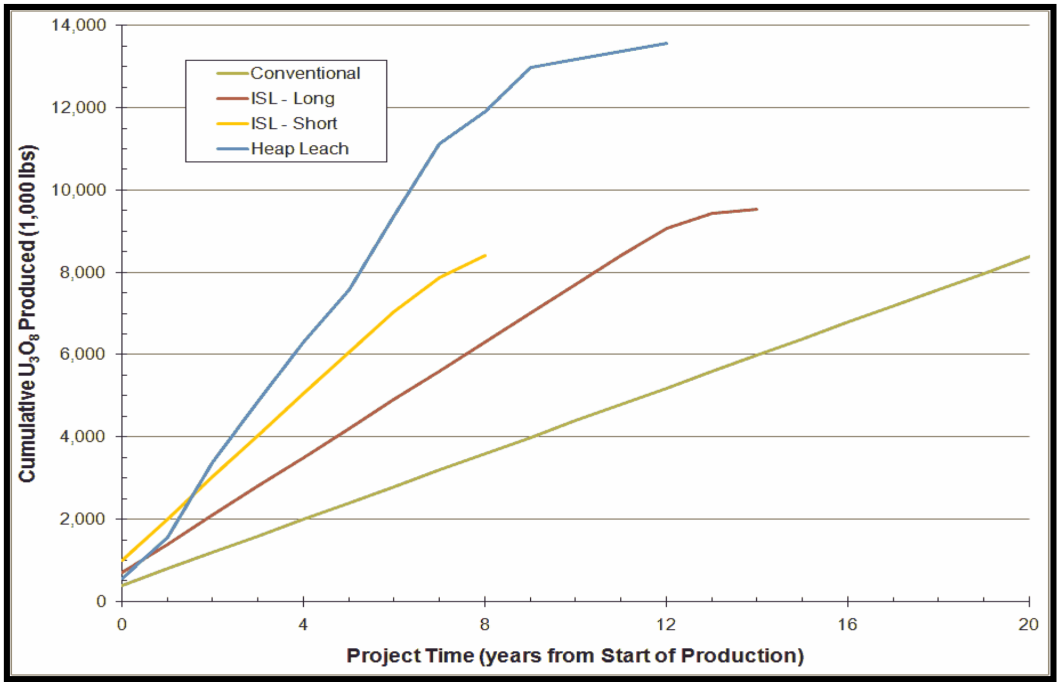


Figure 19: Cumulative U_3O_8 Projections – Reference Cases

6.2.2 Heap Leach Facility Cost Estimate

The base case economic costs for development of a new heap leach facility were developed using data from the proposed new facility at Sheep Mountain in Wyoming (BRS 2011). Specific assumptions used to develop the base case cost estimate for the heap leach facility include:

- The operating duration is 13 years, as per the Sheep Mountain project's uranium production schedule. The annual amount of ore processed averaged 491,758 tons, with maximum and minimum annual processing rates of 916,500 and 74,802 tons, respectively (BRS 2011, page 86).

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the facility capital costs in a manner that would be inconsistent with the estimates provided for the Sheep Mountain project. If additional uranium ore production is to be modeled, a second (or more) and identical heap leach facility should be assumed, either concurrently or sequentially with the first facility.

- Consistent with the Sheep Mountain project cost assumptions, capital investment, totaling $14.177 million, was assumed during the operational period to add more heap leach pads and to replace underground mine equipment. Two additional heap pads were assumed, the first after approximately one-third of the ore is processed, and the second after two-thirds is processed.

- Ore grades were 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The Sheep Mountain project's ore

grades averaged 0.132% for underground and 0.085% for open-pit produced uranium (BRS 2011, page 86).

- The U_3O_8 recovery rate varied between 89% and 92%, depending on the year of operation, as per the Sheep Mountain project (BRS 2011, page 86).

- The cost of open pit mining is $19.28 per ton of ore, while the cost of underground mining is $52.24 per ton, and the cost of heap leach processing is $13.51 per ton (BRS 2011, pages 87 and 88).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $125 million has an annual interest rate of 4%, with a 15-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 20 presents the cost estimates developed for the heap leach facility.

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)			
Open Pit	2,895	N.C.	N.C.
Underground	3,498	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	13,558	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$881,266	$764,878	$643,637
Line of Credit (LoC)	$125,000	$136,591	$153,130
Open Pit Mine			
Capital Costs	$14,590	$14,590	$14,590
Operating Costs	$55,817	$49,594	$42,879
Underground Mine			
Capital Costs	$60,803	$59,880	$58,997
Operating Costs	$182,723	$156,753	$130,078
Heap Pads/Processing Plant			
Capital Costs	$51,885	$50,788	$49,690
Operating Costs	$86,367	$74,973	$63,130

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Shared Costs			
Predevelopment	$10,630	$11,149	$11,874
Reclamation Costs	$17,000	$14,755	$12,416
Taxes, claims, and royalties	$101,346	$87,961	$74,018
Repay LoC/Finance Costs	$168,640	$146,659	$125,441
Total Cost	$749,801	$667,102	$583,114

Figure 18 end of year cash balance for the heap leach facility (as well as for the other uranium recovery facilities). Figure 18 shows that by production year 4, the heap leach facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the heap leach facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the heap leach facility consistently produces the largest quantity of U_3O_8 annually.

6.2.3 In-Situ Leach (Long) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Centennial project in Weld County, Colorado (SRK Consulting 2010b). The Centennial project is expected to have a production period of 14–15 years, which is a long duration for an ISL facility. Annual cost estimates for the Centennial project are provided on pages 117 through 123 of SRK Consulting 2010b. SRK Consulting 2010b, Section 17.11, discusses the basis for the Centennial project cost estimate. Specific assumptions used to develop the ISL (Long) facility base case cost estimate for this analysis include:

- The operating duration is 15 years, as per the Centennial project's uranium production schedule (SRK Consulting 2010b, pages 117 and 120). The facility produces about 700,000 lb of U_3O_8 annually in the first 12 years, then reduces production until only 92,000 lb is produced in the last (15^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Centennial project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Long) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010b, pages 17–24). Funds for restoration are set aside beginning in the second production year and continuing until the end of the project (i.e., year 19 after the start of production).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $85 million has an annual interest rate of 4%, with a 10-year payback period.
- Taxes, claims, and royalties total 11.5% of revenue.
- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 21 presents the cost estimates that were developed for the ISL (Long) facility.

Table 21: In-Situ Leach (Long) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	9,522	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$618,930	$501,943	$390,820
Line of Credit (LoC)	$85,000	$87,550	$90,950
Operating Cost Summary			
Central Plant/Ponds	$66,536	$52,000	$38,805
Satellite/Well Field	$126,708	$109,218	$90,279
Restoration	$11,257	$8,353	$5,844
Decommissioning	$14,818	$9,175	$5,017
G&A Labor	$16,379	$12,849	$9,732
Corporate Overhead	$6,350	$4,969	$3,761
Contingency	$48,410	$39,313	$30,687
Total Operating Costs	$290,458	$235,877	$184,124
Capital Cost Summary			
CPP/General Facilities	$55,097	$54,027	$52,739
Well Fields	$14,209	$13,868	$13,450
G&A	$13,605	$13,428	$13,212
Mine Closure	$12,585	$7,244	$3,555
Miscellaneous	$14,246	$11,055	$8,202
Contingency	$21,948	$19,924	$18,232
Total Capital Costs	$131,690	$119,546	$109,390
Severance, Royalty, Tax	$71,177	$57,723	$44,944
Repay LoC/Finance Costs	$104,797	$92,076	$78,758
Total Cost	$598,122	$505,223	$417,216

Figure 18 shows the end of year cash balance for the ISL (Long) facility (as well as for the other uranium recovery facilities). Figure 18 shows that by the second year of production, the ISL (Long) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Long) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Long) facility produces an annual

amount of U_3O_8 that is midway between the amounts produced by the conventional mill and heap leach facility.

6.2.4 In-Situ Leach (Short) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Dewey-Burdock project in South Dakota (SRK Consulting 2010a). The Dewey-Burdock project is expected to have a production period of about 9 years, which is representative for an ISL facility. SRK Consulting 2010a, pages 96 through 105, presents annual cost estimates for the Dewey-Burdock project, and Section 17.11 of that report discusses the basis for the Dewey-Burdock project cost estimate. Specific assumptions used to develop the ISL (Short) facility base case cost estimate for this analysis include:

- The operating duration is 9 years, as per the Dewey-Burdock project's uranium production schedule (SRK Consulting 2010a, pages 117 and 120). The facility produces about 1,010,000 lb of U_3O_8 annually in the first 6 years, then production declines until only 533,000 lb is produced in the last (9^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Dewey-Burdock project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Short) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010a, pages 17–18). Funds for restoration are set aside beginning in the first production year and continuing for 2 years after production ends (i.e., production year 11).

- The price for U_3O_8 is \$65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of \$70 million has an annual interest rate of 4%, with a 5-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 22 presents the cost estimates developed for the ISL (Short) facility.

Table 22: In-Situ Leach (Short) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	8,408	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$546,520	$491,065	$431,098
Line of Credit (LoC)	$70,000	$72,100	$74,900
Operating Cost Summary			
Central Plant/Ponds	$31,036	$27,485	$23,754
Satellite/Well Field	$130,056	$116,074	$100,788
Restoration	$6,159	$5,207	$4,234
Decommissioning	$11,614	$8,594	$5,835
G&A Labor	$9,750	$8,637	$7,500
Corporate Overhead	$3,900	$3,450	$2,994
Contingency	$38,503	$33,889	$29,021
Total Operating Costs	$208,558	$186,696	$162,811
Capital Cost Summary			
CPP/General Facilities	$49,338	$50,297	$51,598
Well Fields	$37,127	$36,951	$36,787
G&A	$2,507	$2,463	$2,414
Mine Closure	$22,460	$16,640	$11,314
Miscellaneous	$9,565	$8,253	$6,927
Contingency	$19,707	$19,593	$19,545
Total Capital Costs	$140,705	$134,197	$128,586
Severance, Royalty, Tax	$83,444	$74,899	$65,698
Repay LoC/Finance Costs	$78,619	$74,171	$68,984
Total Cost	$511,326	$469,963	$426,079

Figure 18 shows the end of year cash balance for the ISL (Short) facility (as well as for the other uranium recovery facilities). Figure 18 shows that in its first year of production, the ISL (Short) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Short) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Short) facility produces an annual amount of U_3O_8 that is midway between the amounts produced by the ISL (Long) and heap leach facilities.

6.2.5 Cost Estimate Sensitivities

The uranium recovery facility base case cost estimates developed in Sections 6.2.1 through 6.2.4 were based on the specific assumptions presented in each section. One of the key parameters for the determination of the conventional mill and heap leach facility cost estimates is the assumed ore grade. Table 23 presents the average ore grades reported by the EIA for U.S.-origin uranium during 2009. These are the ore grades assumed for the conventional mill and heap leach facility cost estimates. As noted in Section 6.2.2, the ore grades assumed in the Sheep Mountain project

cost estimate (BRS 2011) were very similar to the Table 23 values. However, as noted in Section 6.2.1, the Piñon Ridge project cost estimate used an ore grade of 0.23%, which is considerably higher than the Table 23 EIA values (Edge 2009).

Table 23: Uranium Ore Grade		
Mine Type	Ore Output (1,000 tons)	Ore Grade
Underground	76,000	0.142%
Open Pit	54,000	0.086%
In-Situ Leach	145,000	0.08%
Total	275,000	0.10%

Source: EIA 2011b

Table 24 summarizes the cost estimates for all four uranium recovery facilities developed in Sections 6.2.1 through 6.2.4. It includes the heap leach facility and conventional mill sensitivity cost estimates based on the alternate ore grade and ore processing assumptions just described.

Table 24: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC[1]	w/o LoC[2]
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87
Conventional as Designed	$26.57	$25.45
Heap Leach w/ High Grade Ore	$22.13	$20.59

1 Total cost minus LoC revenue divided by the pounds of U_3O_8 produced
2 Total cost minus LoC revenue minus finance charge divided by the pounds of U_3O_8 produced.

The Piñon Ridge mill is being designed to process 1,000 tpd of uranium ore but, because of current market conditions, is currently being licensed to process only 500 tpd. The cost estimate in Section 6.2.1 is based on a conventional mill processing 500 tpd. As an alternative, the conventional mill cost estimate is recalculated using an ore grade of 0.23% and an ore processing rate of 1,000 tpd. These results have been included in Table 24.

So that the facilities maintain a positive cash flow, the analyses in Sections 6.2.1 through 6.2.4 assumed that each facility would be provided with an LoC to cover the construction and development costs. The amount of the LoC was determined by how much cash was necessary to maintain a positive cash balance. The interest on the LoC was assumed to be 4%, and the period to repay the LoC varied for each facility, depending on the amount of the LoC. The interest paid on the LoC is included in the facility cost estimates developed in Sections 6.2.1 through 6.2.4.

The right hand column of Table 24 shows what the facility-specific cost estimates would be without an LoC (and if the cash flow was allowed to be negative), or if the interest rate was 0%.

Figure 20 shows the effect of alternative assumptions on the cash balance.

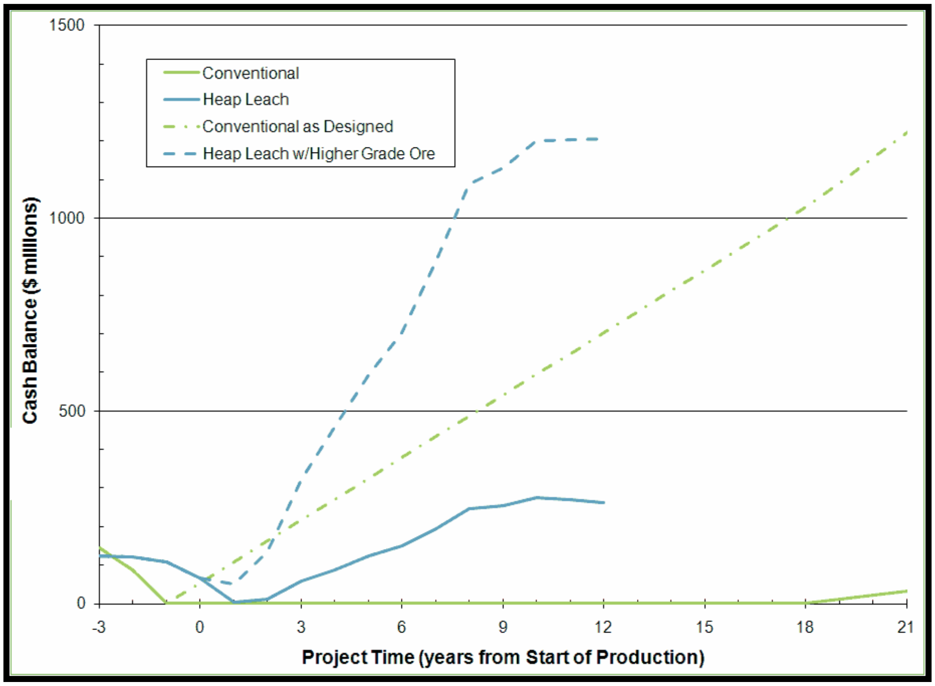


Figure 20: Estimated Cash Balance – Sensitivity Cases

Figure 21 shows the effect of the alternative assumptions on the U_3O_8 production. The obvious conclusion is that the higher the ore grade, the more U_3O_8 is produced, and therefore, the uranium recovery facility is more profitable.

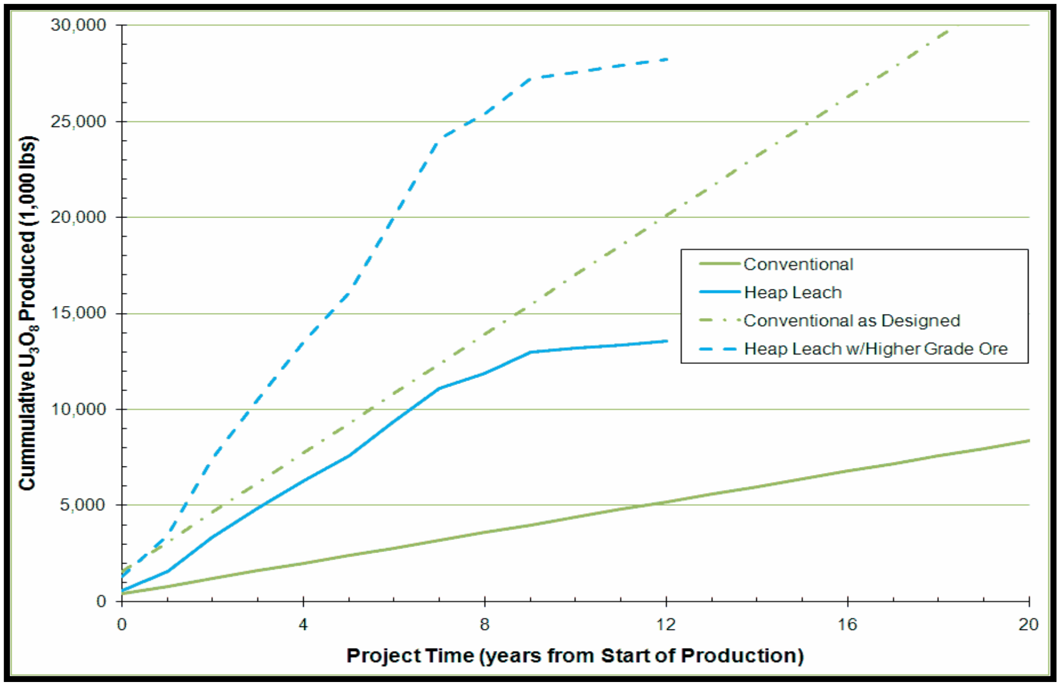


Figure 21: Cumulative U_3O_8 Projections – Sensitivity Cases

6.2.6 Annual Total U_3O_8 Cost Estimates

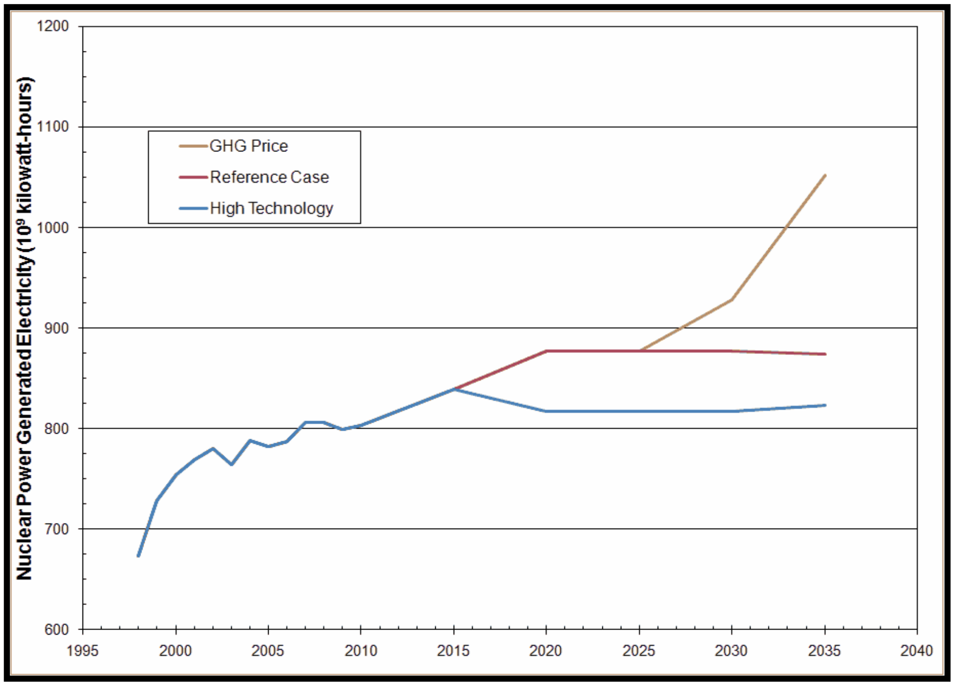
In Sections 6.2.1 through 6.2.4, base case cost estimates were developed for a conventional mill, a heap leach facility, and two ISL facilities. These individual uranium recovery facility cost estimates are used together with the actual 2009 (the last year for which data are available) and projected 2035 U.S.-origin uranium production.

For 2009, the EIA reports that 7,100 thousand pounds of U_3O_8 was produced in the United States (EIA 2011b). For this analysis, the total produced was divided between conventional mills and ISL facilities using the EIA-provided ore outputs, shown in Table 23, which resulted in 3,356,000 lb for conventional mills and 3,744,000 lb for ISL facilities. No heap leach facilities were operating in 2009, so the heap leach production is zero. The 2009 uranium recovery facility total cost and revenue estimates given in Table 18 (page 75) are based on these U_3O_8 production figures and the individual facility unit cost estimates given in Table 24.

These calculated 2009 economic data are based on 2011 dollars (e.g., \$65 per pound of U_3O_8). The 2009 calculated economic data are adjusted to 2009 dollars by assuming an average U_3O_8 price of \$48.92 lb^{-1} (EIA 2010) and adjusting the costs by the ratio of the 2009 energy consumer price index (CPI, 202.301) to the 2011 energy CPI (252.661) (BLS 2011, Table 25). Table 18 (page 75) also gives the 2009 economic data estimates based on 2009 dollars for uranium recovery facilities.

The next part of the analysis was to estimate the future value of the U.S. uranium recovery industry. To this end, it was necessary to estimate the future size of the nuclear power industry. The EIA (2011a) analyzed the U.S. energy outlook for 2011 and beyond, including the contribution from nuclear power. The EIA analyzed a reference case, plus 46 alternative cases,

and determined the nuclear power contribution for each. The EIA reported that in 2010, nuclear power produced 803×10^9 kilowatt-hours of electricity and projected that for the reference case, nuclear power would produce 874×10^9 kilowatt-hours in 2035 (EIA 2011a). Of the 46 alternative cases, the Greenhouse Gas (GHG) Price Economywide and Integrated High Technology cases had the largest and smallest projected nuclear power contributions in 2035, respectively. The GHG Price Economywide case was projected to contribute $1{,}052 \times 10^9$ kilowatt-hours in 2035, while the Integrated High Technology case was projected to contribute 823×10^9 kilowatt-hours. Figure 22 shows and compares the EIA projections.



Source: EIA 2011a

Figure 22: Nuclear-Generated Electricity Projections

It is assumed that the 2035 to 2009 U_3O_8 requirements would have the same ratio as the 2035 to 2010 EIA (2011a) nuclear power estimates. Thus, for the EIA Reference Nuclear, Low Nuclear Production (Integrated High Technology), and High Nuclear Production (GHG Price Economywide) cases, the total U_3O_8 requirements in 2035 are estimated to be 7,728, 7,277, and 9,302 thousand pounds, respectively. Costs were estimated for four cases, with each case assuming a different type of uranium recovery facility responsible for producing the required U_3O_8. The cases are (1) only conventional mills, (2) only ISL facilities, (3) only heap leach facilities, and (4) a mixture of all three types of facilities.

To divide the total U_3O_8 requirement among the three types of uranium recovery facilities for Case 4, it is assumed that one reference heap leach facility would be operational, and that the remainder of the U_3O_8 would be divided between conventional mills and ISL facilities with the same ratio as in 2009. The total amount of U.S.-origin U_3O_8 for each of the 2035 projections is shown in Table 25 for Case 4. For the remaining three cases, the total 2035 projections given in Table 25 were assumed to be produced by the particular mine type associated with the case.

Table 25: Assumed Case 4 U_3O_8 Production Breakdown by Mine Type

Mine Type	U_3O_8 Produced (1,000 lb)				
	2009	2035 Projections			
		Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
Conventional	3,356	3,159	2,947	3,903	4,642
In-Situ Leach	3,744	3,525	3,287	4,355	5,178
Heap Leach	—	1,043	1,043	1,043	1,043
Total	7,100	7,728	7,277	9,302	10,862

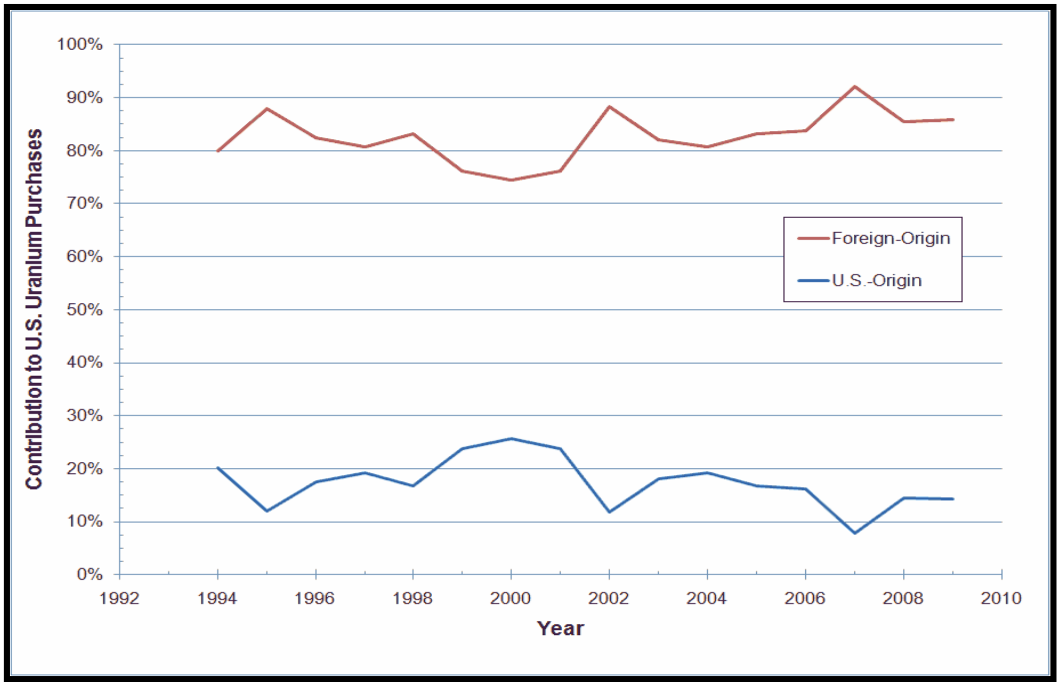
Source: EIA 2011b

The 2035 total cost and revenue estimates for uranium recovery facilities appear in Table 18 (page 75) and are based on the Table 25 U_3O_8 productions and the individual facility unit cost estimates given in Table 24. Refer to Section 6.2 for a discussion of the Table 18 total cost and revenue estimates. Table 26 gives a breakdown by facility type for Case 4, the mixed uranium recovery facility case.

Table 26: Case 4 (Mixed Uranium Recovery Facilities) Economic Projections (Nondiscounted)

Cost/Revenue	2035 Projections ($1,000)			
	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$502,305	$472,994	$604,605	$706,057
Conventional	$205,407	$191,551	$253,767	$301,726
In-Situ Leach	$229,108	$213,653	$283,048	$336,541
Heap Leach	$67,790	$67,790	$67,790	$67,790
U_3O_8 Cost	$391,584	$368,411	$472,461	$552,668
Conventional	$162,932	$151,941	$201,292	$239,334
In-Situ Leach	$180,590	$168,409	$223,108	$265,273
Heap Leach	$48,062	$48,062	$48,062	$48,062

The EIA (2010, Table S1a) shows that most of the U_3O_8 purchased in the United States is of foreign origin (see Figure 23). In 2009, the 7,100 thousand pounds of U_3O_8 produced in the United States amounted to only 14.2% of the total amount of U_3O_8 purchased. Since the total cost and revenue estimates in Table 18 (page 75) are based on the 2009 U.S.-produced U_3O_8, then those estimates include the assumption that 85.8% of the U.S.-purchased U_3O_8 is of foreign origin. As Figure 23 shows, the amount of foreign origin U_3O_8 has fluctuated over time. If all of the U_3O_8 that is purchased in the United States were to be supplied domestically, then the total cost and revenue estimates shown in Table 18 would increase by a factor of 7 (i.e., 1/0.142 = 7). However, this is considered to be unrealistic and is unsupported by the data shown in Figure 23. As an alternative, the Ref Low Import case shown in Table 18 assumes that 20% of the 2035 EIA Reference case U_3O_8 needs would be met domestically.



Source: EIA 2010, Table S1a

Figure 23: U.S. and Foreign Contribution to U_3O_8 Purchases

6.3 Economic Assessment of Proposed GACT Standards

EPA is proposing to revise Subpart W by introducing three categories related to how uranium recovery facilities manage byproduct materials during and after the processing of uranium ore. are presented and described in Section 5.4 presents and describes the proposed GACTs for each category. This section presents the costs and benefits associated with the implementation of the various components of the GACTs. The first category is the standards for conventional mill tailings impoundments. The second category consists of requirements for nonconventional impoundments where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids. Examples of this category are evaporation or holding ponds that exist at conventional mills and ISR and heap leach facilities. Requirements in this second category are that the nonconventional impoundments be provided with a double liner (Section 6.3.2) and that liquid at a depth of 1 meter be maintained in the impoundment (Section 6.3.3). The third category of revised Subpart W would require that heap leach piles be provided with a double liner (Section 6.3.4) and that the pile's moisture content be maintained above 30% by weight (Section 6.3.5). Additionally, the revised Subpart W would remove the requirement to monitor the radon flux at conventional facilities constructed on or prior to December 15, 1989 (Section 6.3.1).

6.3.1 Method 115, Radon Flux Monitoring

Existing Subpart W regulations require licensees to perform annual monitoring using Method 115 to demonstrate that the radon flux at conventional impoundments constructed before December 15, 1989, is below 20 pCi/(m^2-sec). The elimination of this monitoring requirement

would result in cost savings for the three facilities to which this requirement still applies: Sweetwater, White Mesa, and Shootaring Canyon.[9]

Radon Flux Monitoring Unit Costs

Method 115 requires that multiple large-area activated charcoal collectors (LAACCs) be employed to make radon flux measurements. The first step in preparing this cost estimate was to develop the cost for making a single LAACC radon flux measurement. Unit cost data for performing LAACC radon flux measurements were obtained from three primary sources: the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (EPA 2000a), KBC Engineers (KBC 2009), and Waste Control Specialists (WCS 2007). Weston Solutions provided fully loaded billing rates for radiation safety officers (RSOs) and certified health physicists (CHPs) (WS 2003).

MARSSIM (EPA 2000a)—MARSSIM is a multivolume document that presents methodologies for performing radiation surveys. Appendix H to MARSSIM describes field survey and laboratory analysis equipment, including the estimated cost per measurement. Included in Appendix H is the cost estimate for performing an LAACC measurement. The MARSSIM estimated cost range for LAACC radon flux measurements is $20 to $50 per measurement, including the cost of the canister. Since MARSSIM, Revision 1, was published in August 2000, it is assumed that this cost estimate is in 2000 dollars. MARSSIM does not estimate the cost for deploying the canisters or for final report preparation.

KBC Engineers (KBC 2009)—In November 2009, KBC Engineers prepared a revised "Surety Rebaselining Report" for the Kennecott Uranium Company's Sweetwater Uranium Project, which included an estimate for the cost of performing Method 115 radon flux monitoring. KBC based the canister testing cost of $50 per canister on past invoices received from Energy Laboratories, Inc. (a commercial analytical laboratory). In addition to the cost for the laboratory work, KBC included estimates for setting up and retrieving canisters in the field and for data analysis and report preparation. KBC estimated that a technician/engineer with a fully loaded billing rate of $100 per hour would require 40 hours to set up and retrieve 110 canisters, or $36.36 per canister. Also, KBC estimated that an engineer/scientist with a fully loaded billing rate of $105 per hour would require 20 hours for data analysis and report preparation for the 110 canisters, or $19.06 per canister. The KBC unit cost estimates are in 2009 dollars.

Waste Control Specialists (WCS 2007)—In its application to construct and operate a byproduct material disposal facility,[10] Waste Control Specialists, LLC (WCS) included a closure plan and corresponding cost estimate. As part of the final status survey, the radon flux through the disposal unit cap will be measured using LAACCs. WCS used the MARSSIM value as the cost for testing the canister. In addition, WCS included the cost of an RSO at $75 per hour to conduct the survey and prepare report and the cost of a CHP at $104 per hour to review the survey data. For the 100 canisters assumed, WCS assumed the RSO would require 40 hours for a cost of $30

[9] Cotter Corporation has indicated that the primary impoundments at its Cañon City site are no longer active, and thus, it has stopped performing Subpart W radon flux monitoring at that site (Thompson 2010).

[10] The WCS facility is not a conventional tailings facility or a uranium recovery facility. It was specially constructed to handle the K-65 residues that were stored at DOE's Fernald site.

per canister and the CHP would require 10 hours, or $10.40 per canister. The WCS unit costs are in 2004 dollars.

Weston Solutions (WS 2003)—Weston Solutions did not estimate the cost associated with Method 115 radon flux monitoring, but it did include the fully loaded hourly billing rates for radiation supervisors (equivalent to RSOs) and CHPs of $78 and $133, respectively. These billing rates are in 2003 dollars.

Unit Costs—Table 27 summarizes the data provided in the four source documents. The first step was to adjust all of the data to constant 2011 dollars. The CPI (DOL 2012) was used to make this adjustment. The right side of Table 27 shows the adjusted cost data.

Table 27: Data Used to Develop Method 115 Unit Costs

Data as Provided						Adjusted to November 2011 (CPI = 226.23)		
Source	Date	CPI	Cost per Canister			Cost per Canister		
			Testing	Setup/ RSO	Analysis/ CHP	Testing	Setup/ RSO	Analysis/ CHP
EPA 2000a	Aug-00	172.8	$20.00	N.G.	N.G.	$26.18	N.G.	N.G.
			$50.00	N.G.	N.G.	$65.46	N.G.	N.G.
WS 2003	Dec-03	184.3	N.G.	$31.20	$13.30	N.G.	$38.30	$16.33
WCS 2007	May-07	207.949	$25.00	$30.00	$10.40	$27.20	$32.64	$11.31
			$50.00			$54.40		
KBC 2009	Nov-09	216.33	$50.00	$36.36	$19.09	$52.29	$38.03	$19.96

N.G. = not given in the source document

Based on the data from Table 27, minimum, average, and maximum unit costs for performing Method 115 radon flux monitoring were estimated and are shown in Table 28.

Table 28: Method 115 Unit Costs

Type	LAACC Unit Cost ($/Canister)			
	Testing	Setup/RSO	Analysis/CHP	Total
Minimum	$26.18	$32.64	$11.31	$70.14
Average	$45.11	$36.32	$15.87	$97.29
Maximum	$65.46	$38.30	$19.96	$123.72

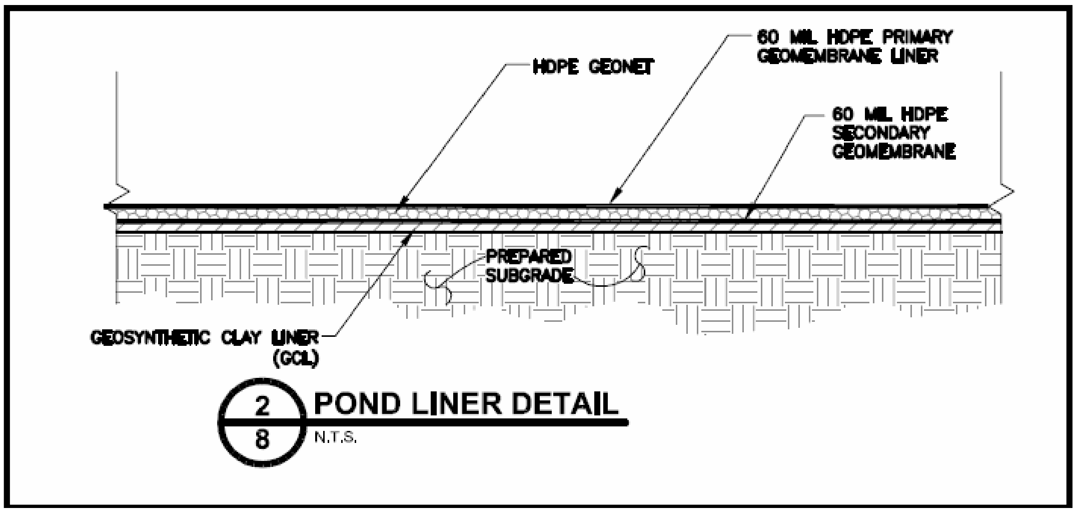
Total Annual Cost Savings (Benefit)

Method 115 requires 100 measurements per year as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. Additionally, if there are exposed beaches or soil-covered areas (as is likely at White Mesa), then an additional 100 measurements are necessary. Thus, for the three sites still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring (based on the Table 28 LAACC unit costs) is estimated to be about $9,730 per site per year for Shootaring and

Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 yr^{-1}, with a range from approximately $28,000 to $49,500 yr^{-1}.

6.3.2 Double Liners for Nonconventional Impoundments

Uranium byproduct materials are often stored in onsite impoundments at uranium recovery facilities, including in holding ponds and evaporation ponds. These ponds can be collectively referred to as nonconventional impoundments, to distinguish them from conventional tailings impoundments. This section provides an estimate of the cost to provide these nonconventional impoundments with a double liner, including a leak collection layer. Figure 24 shows a typical design of an impoundment double liner.



Source: Golder 2008, Drawing 8

Figure 24: Typical Double-Lined Impoundment with Leak Collection Layer

Double Liner Unit Costs

Unit costs, per square foot of liner, have been estimated for the three components of the double liner system: the geomembrane (HDPE) liner, the drainage (Geonet) layer, and the geosynthetic clay liner (GCL).

HDPE Unit Cost—The geomembrane (HDPE) liner installation unit cost estimates shown in Table 29 were obtained from the indicated documents and Internet sites. The Table 29 unit costs include all required labor, materials, and manufacturing quality assurance documentation costs (Cardinal 2000, VDEQ 2000). Where necessary, the unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 29 geomembrane (HDPE) liner mean unit cost is $0.95 ft^{-2}, the median cost is $0.74 ft^{-2}, while the minimum and maximum costs are $0.45 and $2.35, respectively.

Table 29: Geomembrane (HDPE) Liner Unit Costs

Data Source	Unit Cost (ft^{-2})		Thickness - Area
	As Given	2011$	
Foldager 2003	$0.37	$0.45	Not Specified
Vector 2006	$0.45	$0.50	60 mil
Cardinal 2000	$0.39	$0.51	60 mil - 470,800 SF
Cardinal 2000	$0.40	$0.52	60 mil - 138,920 SF
Earth Tech 2002	$0.45	$0.57	60 mil
Cardinal 2000	$0.47	$0.61	60 mil - 118,800 SF
VDEQ 2000	$0.48	$0.63	60 mil
Duffy 2005	$0.60	$0.70	40 mil
Get-a-Quote	$0.70	$0.70	40 mil
Cardinal 2000	$0.54	$0.71	60 mil - 60,600 SF
MWH 2008	$0.70	$0.74	40 mil
Project Navigator 2007	$0.70	$0.76	60 mil
MWH 2008	$0.80	$0.84	80 mil
Get-a-Quote	$0.86	$0.86	60 mil
EPA 2004	$0.80	$0.96	60 mil
Get-a-Quote	$1.04	$1.04	80 mil
Free Construction	$1.05	$1.05	40 mil
Free Construction	$1.69	$1.69	60 mil
Foldager 2003	$1.40	$1.72	Not Specified
Free Construction	$2.00	$2.00	80 mil
Lyntek 2011	$2.35	$2.35	80 mil

Drainage Layer (Geonet) Unit Cost—Some of the documents reviewed included unit cost estimates for installation of the drainage (Geonet) layer, as shown in Table 30. As with the geomembrane (HDPE) liner unit costs, the drainage (Geonet) layer unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 30 drainage layer (Geonet) mean unit cost is $0.64 ft^{-2}, the median cost is $0.57 ft^{-2}, while the minimum and maximum costs are $0.48 and $1.02, respectively.

Table 30: Drainage Layer (Geonet) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
EPA 2004	$0.40	$0.48
Project Navigator 2007	$0.45	$0.49
Earth Tech 2002	$0.45	$0.57
MWH 2008	$0.60	$0.63
Duffy 2005	$0.88	$1.02

Geosynthetic Clay Liner (GCL) Unit Cost—Some of the documents reviewed also included unit cost estimates for installation of the GCL, as shown in Table 31. As for the geomembrane (HDPE) liner unit costs, the CPI was used to adjust the GCL unit costs from the year they were estimated to year 2011 dollars. The Table 31 GCL mean unit cost is \$0.69 ft^{-2}; the median cost is \$0.65 ft^{-2}; and the minimum and maximum costs are \$0.45 and \$1.12, respectively.

Table 31: Geosynthetic Clay Liner (GCL) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	**2011$**
Vector 2006	\$0.40	\$0.45
EPA 2004	\$0.40	\$0.48
Earth Tech 2002	\$0.52	\$0.65
Project Navigator 2007	\$0.70	\$0.76
Lyntex 2011	\$1.12	\$1.12

Some designs may choose to use a compacted clay layer beneath the double liner (e.g., Figure 26). However, Sandia (1998) has found that "[r]eplacing the 60 cm thick clay (amended soil) barrier layer with a GCL drastically reduced the cost and difficulty of construction." This savings was due to avoiding the expense of obtaining the bentonite clay and the difficulties of the clay being "sticky to spread and slippery to drive on," plus "compaction was extremely difficult to achieve." For these reasons, it is believed that GCL will be used in most future applications and is thus appropriate for this cost estimate.

Design and Engineering—The cost estimates include a 20% allowance for design and engineering for the mean and median estimates, and a 10% and 20% allowance for the minimum and maximum estimates, respectively. The design and engineering cost has been calculated by multiplying the capital and installation cost by the allowance factor.

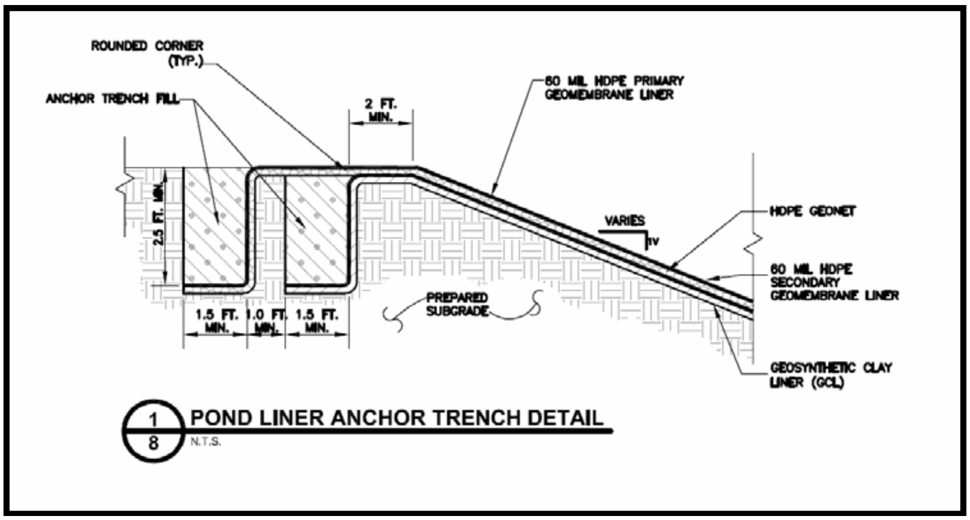
Contractor Oversight—The cost estimates include a 20% allowance for contractor oversight for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The contractor oversight cost has been calculated by multiplying the capital and installation cost by the allowance factor.

Overhead and Profit—The cost estimates include a 20% allowance for overhead and profit for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The overhead cost and profit has been calculated by multiplying the sum of the capital and installation, design and engineering, and contractor oversight costs by the allowance factor.

Contingency—The cost estimates include a contingency factor of 20% for the mean and median estimates, and 15% and 25% for the minimum and maximum estimates, respectively. The contingency has been calculated by multiplying the sum of all of the other costs by the contingency factor.

Double Liner Capital and Installation Cost

Impoundment Areas—Figure 25 shows that in order to anchor the upper liner and drainage layer (Geonet), an additional 8.5 ft of material is required on each side of the impoundment. Similarly, an additional 6 ft of material is required on each side of the impoundment to anchor the lower liner and the GCL.



Source: Golder 2008, Drawing 8

Figure 25: Typical Double Liner Anchor System

Section 6.2 describes base facilities for each type of uranium recovery facility: conventional, ISR, and heap leach. Since they are not given in Section 6.2, Table 32 shows the impoundment surface areas for each of the base facilities, plus the areas of the upper liner, drainage layer (Geonet), lower liner, and GCL. The liner areas include additional material in order to anchor the liner, plus an additional 10% to account for the sloping of the sides and waste.

Table 32: Nonconventional Impoundment Areas

Facility Type	Impoundment Type	Number	Area (acres)		
			Surface	Upper Liner & Geonet	Lower Liner & GCL
Conventional (Golder 2008)	Evaporation	10	4.13	4.94	4.82
	Total	10	41.30	49.39	48.22
ISR (Powertech 2009)	Water Storage	10	7.20	8.41	8.26
	Process Water	1	3.31	3.98	3.88
	Total	11	75.31	88.05	86.50
Heap (Titan 2011)	Raffinate	1	0.9	1.17	1.11
	Collection	1	1.5	1.88	1.81
	Evaporation	1	5.7	6.71	6.58
	Total	3	8.10	9.75	9.50

Impoundment Double Liner Cost—Based on the above estimated quantities of material and unit costs, Table 33 presents the median, minimum, and maximum capital costs for installing the

double liner beneath the impoundments of each of the three types of uranium recovery facilities: conventional, ISR, and heap leach.

Table 33: Base Facility Nonconventional Impoundment Double Liner Capital and Installation Costs

Cost Type	Conventional	ISR	Heap
Mean	$13,800,000	$24,700,000	$2,700,000
Median	$11,500,000	$20,600,000	$2,300,000
Minimum	$6,500,000	$11,600,000	$1,300,000
Maximum	$32,900,000	$58,900,000	$6,500,000
Mean, w/o Upper Liner	$6,800,000	$12,100,000	$1,300,000

To demonstrate the individual component contribution to the total capital and installation cost, Table 34 presents the calculated mean capital cost breakdown by category.

Table 34: Mean Base Facility Nonconventional Impoundment Double Liner Capital and Installation Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Impoundment Double Liner Capital and Installation Cost		
		Conventional	ISR	Heap
Upper Liner	$0.95	$2,040,654	$3,638,014	$402,799
Drainage (Geonet)	$0.64	$1,370,814	$2,443,844	$270,581
Lower Liner	$0.95	$1,992,191	$3,573,958	$392,414
GCL	$0.69	$1,455,818	$2,611,714	$286,761
Design & Engineering	20%	$1,371,895	$2,453,506	$270,511
Contractor Oversight	20%	$1,371,895	$2,453,506	$270,511
Overhead & Profit	20%	$1,920,654	$3,434,908	$378,715
Contingency	20%	$2,304,784	$4,121,890	$454,459
Total	—	$13,828,706	$24,731,338	$2,726,751

Table 33 includes capital and annual cost estimates for a mean, without upper liner case. This case was added because, even if not required to comply with 40 CFR 192.32(a)(1), the design of nonconventional impoundments at uranium recovery facilities would include at least a single liner. The reason is that the NRC, in 10 CFR 40, Appendix A, Criterion 5(A), requires that "… surface impoundments (…) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water … ." Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

Double Liner Total Annual Cost

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb.

Table 35 presents the calculated annualized cost for installation of a double liner in a nonconventional impoundment for the 2035 projected U_3O_8 productions. The annualized cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of each uranium recovery facility, and then multiplying by the projected amount of U_3O_8 produced annually. Table 35 presents four cases. In the first three cases, it was assumed that a single type of uranium recovery facility would produce all of the U_3O_8 required in 2035, while in the fourth case, it was assumed that a mixture of uranium recovery facilities would be operating in 2035. For the fourth case, Table 25 gives the contribution to the total U_3O_8 required in 2035 by each type of facility.

Table 35: Projected Nonconventional Impoundment Double Liner Annualized Capital and Installation Costs

Cost Type	Projected 2035 U_3O_8 Production	Annualized Capital and Installation Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$6,700,000	$22,700,000	$1,600,000	$14,800,000
Median	Reference Nuclear	$5,600,000	$18,900,000	$1,400,000	$12,400,000
Minimum	Low Nuclear Production	$2,900,000	$10,000,000	$700,000	$6,500,000
Maximum	Reference Low Import	$22,400,000	$76,100,000	$5,500,000	$49,300,000
Mean, w/o Upper Liner	Reference Nuclear	$3,300,000	$11,100,000	$800,000	$7,300,000

In addition to the annualized capital and installation costs, the total annual cost includes the costs associated with the operation and maintenance (O&M) of the double liner. For the double liner, O&M would consist of daily inspection of the liner and repair of the liner when rips or tears are observed above the water level or when water is detected in the leak detection layer. Since daily inspections of the nonconventional impoundments are part of the routine operation of the uranium recovery facility (Visus 2009), the only additional O&M cost associated with the double liner would be the repair costs. It was assumed that the annual O&M cost for the nonconventional impoundments would be 0.5% of the total capital cost for installing the liners (MWH 2008 and Poulson 2010). Using the Table 33 base facility cost estimates for installation of the double liner, Table 36 shows the calculated double liner O&M costs for each base facility.

Table 36: Base Facility Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	O&M Allowance	Base Facility Annual O&M Cost ($/yr)		
		Conventional	ISR	Heap
Mean	0.5%	$68,000	$120,000	$13,000
Median	0.5%	$56,000	$100,000	$11,000
Minimum	0.25%	$16,000	$29,000	$3,200
Maximum	1.0%	$330,000	$590,000	$65,000
Mean, w/o Upper Liner	0.5%	$34,000	$61,000	$6,700

Table 37 shows annual O&M costs for the projected 2035 U_3O_8 productions. The Table 37 annual O&M costs were calculated by dividing the Table 36 costs by each base facility's annual U_3O_8 production and then multiplying by the projected 2035 U_3O_8 production.

Table 37: Projected Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	Projected 2035 U_3O_8 Production	Annual Operation and Maintenance Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$1,300,000	$990,000	$50,000	$1,100,000
Median	Reference Nuclear	$1,100,000	$830,000	$39,000	$950,000
Minimum	Low Nuclear Production	$300,000	$230,000	$11,000	$250,000
Maximum	Reference Low Import	$9,000,000	$6,900,000	$330,000	$7,600,000
Mean, w/o Upper Liner	Reference Nuclear	$700,000	$500,000	$24,000	$560,000

The total annual cost for a double liner in a nonconventional impoundment is simply the sum of the annualized capital (Table 35) and installation cost plus the annual O&M cost (Table 37). Table 38 shows these total annual costs for the five cost types and four assumed uranium recovery facility cases.

Table 38: Projected Nonconventional Impoundment Double Liner Total Annual Costs

Cost Type	Projected 2035 U_3O_8 Production	Total Annual Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$8,000,000	$23,700,000	$1,700,000	$16,000,000
Median	Reference Nuclear	$6,700,000	$19,800,000	$1,400,000	$13,300,000
Minimum	Low Nuclear Production	$3,200,000	$10,200,000	$700,000	$6,800,000
Maximum	Reference Low Import	$31,400,000	$83,000,000	$5,800,000	$56,900,000
Mean, w/o Upper Liner	Reference Nuclear	$3,900,000	$11,700,000	$800,000	$7,800,000

Section 6.2, Table 18 (page 75), shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection. Table 39 compares those total U_3O_8 production costs to the double liner total costs given in Table 38. As Table 39 shows, the cost to install a double liner is less than 6% of the total cost to produce U_3O_8, while the cost to upgrade from a single liner to a double liner is less than 3% of the total cost.

Table 39: Comparison of Double Liner to Total U_3O_8 Production Costs

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)			Liner Contribution	
	Total Annual (Table 18)	Double Liner (Table 38)	Single to Double (Table 38)	Double Liner	Single to Double
Conventional	$398	$8.0	$3.9	2.0%	1.0%
In-Situ Leach	$411	$23.7	$11.7	5.8%	2.8%
Heap Leach	$356	$1.7	$0.8	0.5%	0.2%
Mixed Facilities	$396	$16.0	$7.8	4.0%	2.0%

Finally, the conventional, ISR, and heap leach base uranium recovery facilities (see Section 6.2) include a double liner, with drainage layer (Geonet) collection system for their onsite

impoundment designs. Thus, there is no additional cost for the Section 6.2 base uranium recovery facilities to meet the design and construction requirements at 40 CFR 192.32(a)(1) for onsite nonconventional impoundments.

Benefits from a Double Liner for a Nonconventional Impoundment

Including a double liner in the design of all onsite nonconventional impoundments that would contain uranium byproduct material would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, decision makers should consider this benefit because of the significance of ground water as a source of drinking water.

6.3.3 Maintaining 1 Meter of Water in Nonconventional Impoundments

As shown in Section 3.3.1, as long as a depth of approximately 1 meter of water is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine if there is any contribution above background radon values. This section estimates the cost to maintain 1 meter of water in the impoundment.

In order to maintain 1 meter, or any level, of water within a pond it is necessary to replace the water that is evaporated from the pond. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with makeup water supplied by the pond's operator. The replacement process is assumed to be required as part of the normal operation of the uranium recovery facility, which would occur regardless of the GACT. Thus, this cost estimate does not include process water replacement.

Unit Cost of Water

Three potential sources of pond makeup water were considered: municipal water suppliers, offsite non-drinking-water suppliers, and onsite water.

Municipal Water Supplier (Black & Veatch 2010)—In 2009/2010, a survey of the cost of water in the 50 largest U.S. cities was performed (Black & Veatch 2010). The survey compiled typical monthly bill data for three residential (3,750, 7,500, and 15,000 gallon/month), a commercial (100,000 gallon/month), and an industrial (10,000,000 gallon/month) water users. For this study, the commercial and industrial data were normalized to dollars per gallon, and the higher of the two values was used.

The survey found that the cost of water ranged from \$0.0012 gallon^{-1} in Sacramento, California, to \$0.0066 gallon^{-1} in Atlanta, Georgia, with a mean of \$0.0031 gallon^{-1} and a median of \$0.0030 gallon^{-1}. Looking at only those cities located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, and Texas; the survey included no cities in Utah or Wyoming), the survey found that the cost of water ranged from \$0.0016 gallon^{-1} in Albuquerque, New Mexico, to \$0.0045 gallon^{-1} in Austin, Texas, with a mean and median of \$0.0031 gallon^{-1}.

Offsite Non-Drinking-Water Suppliers (DOA 2004)—The water supplied by municipal water suppliers has been treated and is suitable for human consumption. It is not necessary for

impoundment evaporation makeup water to be drinking water grade. Therefore, using the data from the 50-city survey would likely overestimate the impoundment makeup water cost. Unfortunately, no data could be found as to the cost of non-drinking-water grade water for use as impoundment makeup water. However, another large scale use of non-drinking-water grade water is for crop irrigation, and the U.S. Department of Agriculture has compiled data on the cost of irrigation water for crops (DOA 2004).

For offsite sources of irrigation water, the Department of Agriculture states that the "31.6 million acre-feet of water received from off-farm water suppliers … cost irrigators $579 million, for an average cost of $18.29 per acre-foot of water …" (DOA 2004, page XXI), or \$0.000056 gallon^{-1}.

Onsite Water (DOA 2004)—The Department of Agriculture identifies both wells (43.5 million acre-feet) and surface water (11.8 million acre-feet) as sources of onsite water. The cost for both sources is essentially the cost to pump the water from its source to where it is used. Unfortunately, the Department does not provide separate pumping costs for each onsite source, but instead states:

> *There were 497,443 irrigation pumps of all kinds used on 153,117 farms in 2003 irrigating 42.9 million acres of land. These pumps were powered by fuels and electricity costing irrigators a total of $1.55 billion or an average of $10,135 per farm. The principal energy source used was electricity, for which $953 million was spent to power 319,102 pumps that irrigated 24.1 million acres at an average cost of $39.50 per acre. Solar energy was reported as the source for pumping wells on 360 farms irrigating 16,430 acres.* [DOA 2004, page XXI]

From these data, it is possible to determine that the mean cost for pumping onsite water from both sources is \$0.000086 gallon^{-1}. Also, on a per acre basis, the cost of using electricity to pump the water is slightly higher than the total average cost (i.e., $39.50 versus $36.13), and the use of solar energy to pump water is very rare (i.e., only about 0.03%).

Unit Costs—Table 40 shows the makeup water unit costs that have been estimated for this study. As described, the municipal water source costs are taken from Black & Veatch 2010, while the mean costs for offsite non-drinking and onsite water sources were taken from DOA 2004. All unit water costs were adjusted to 2011 dollars.

Although the Department of Agriculture did not present sufficient data to allow for the calculation of minimum, maximum, and median unit water costs, these costs were estimated by assuming that the cost of offsite non-drinking and onsite water sources have variation in costs similar to the variation in municipal supplier costs. Table 40 also shows these estimated makeup water unit costs.

Table 40: Makeup Water Unit Costs

Area	Source	Makeup Water Unit Costs ($gallon^{-1}$)			
		Minimum	Mean	Median	Maximum
United States	Municipal Supplier	$0.0013	$0.0033	$0.0032	$0.0069
	Offsite Non-Drinking	$0.000027	$0.000069	$0.000067	$0.000144
	Onsite Source	$0.000041	$0.00011	$0.00010	$0.00022
Potential Uranium Producing States (AZ, CO, NM, TX)	Municipal Supplier	$0.0017	$0.0032	$0.0033	$0.0047
	Offsite Non-Drinking	$0.000035	$0.000068	$0.000068	$0.000099
	Onsite Source	$0.000054	$0.00010	$0.00010	$0.00015

Additionally, Edge (2009) presents the discounted cost of estimated consumptive water use for the Piñon Ridge conventional mill. With 3% and 7% discount rates, the 40-year cost of water was presented as $58,545 and $33,766, respectively, which translates into an annual cost of $2,533. Edge (2009, page 7-2) indicates that the Piñon Ridge mill is estimated to use 227 acre-feet of water per year. This gives a water unit cost of $0.000034, which is consistent with the Table 40 offsite non-drinking and onsite water sources unit costs.

Total Annual Cost to Maintain 1 Meter of Water

Required Water Makeup Rate (Net Evaporation Rate)—As stated above, in order to maintain the water level within a nonconventional impoundment, it is necessary to replace the water that is evaporated from the impoundment. Some (and in some places all) of the evaporated water will be made up by naturally occurring precipitation. Figure 17 shows the annual evaporation (inches per year (in/yr)) of the lower 48 states, while Figure 16 shows the annual precipitation (in/yr). To determine the annual required water makeup rate, the Figure 16 data is simply subtracted from the Figure 17 data. A positive result indicates that evaporation is greater than precipitation, and makeup water must be supplied, whereas a negative result indicates that precipitation is sufficient to maintain the impoundment's water level.

The U.S. Army Corps of Engineers (ACE) has published net lake evaporation rates for 152 sites located in the United States (ACE 1979, Exhibit I). The ACE found that the net evaporation ranged from -35.6 in/yr in North Head, Washington, to 96.5 in/yr in Yuma, Arizona, with a mean of 10.8 in/yr and a median of 0.9 in/yr. At 82 sites, the evaporation rate exceeds the precipitation rate, and makeup water would be required to maintain the impoundment's water level.

Looking at only those 22 sites located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, Texas, Utah, and Wyoming), the ACE found that the net evaporation rate ranged from 6.1 in/yr in Houston, Texas, to 96.5 in/yr in Yuma, Arizona, with a mean of 45.7 in/yr and a median of 41.3 in/yr. The evaporation rate exceeded the precipitation rate at all 22 sites in the potentially uranium-producing states included in the ACE study.

Uranium Recovery Facility Pond Size—As described in Section 6.2, a base facility was assumed for each of the three types of uranium recovery facilities. Table 41 gives information for each base facility that is necessary to calculate the annual makeup water cost (i.e., the surface area of the onsite impoundments and the annul U_3O_8 production).

Table 41: Summary of Base Facility Characteristics

Parameter		Conventional	ISR	Heap
Impoundment Surface Area	(acres)	41.3	75.3	8.1
U_3O_8 Production	(lb/yr)	400,000	930,000	2,200,000

Total Annual Cost—The only cost associated with maintaining the water level within the impoundment is the cost of the water. It is assumed that existing piping will connect the nonconventional impoundment to the water source, and that the water level will be visually checked at least once per day (Visus 2009).

The makeup water unit cost data from Table 40, the net evaporation rates from above (page 102), and the impoundment areas from Table 41 are combined to calculate annual makeup water cost estimates provided in Table 42.

Table 42: Base Facility Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)		
			Conventional	ISR	Heap
Mean	$0.00010	45.7	$5,313	$9,687	$1,042
Median	$0.00010	41.3	$4,840	$8,826	$949
Minimum	$0.000035	6.1	$240	$438	$47
Maximum	$0.00015	96.5	$16,337	$29,790	$3,204

The annual cost of makeup water from Table 42 was divided by the base facility U_3O_8 annual production rate from Table 41 to calculate the makeup water cost per pound of U_3O_8 produced, shown in Table 43.

Table 43: Base Facility Makeup Water Cost per Pound of U_3O_8

Cost Type	Makeup Water Cost ($/lb)		
	Conventional	ISR	Heap
Mean	$0.0133	$0.0104	$0.00047
Median	$0.0121	$0.0095	$0.00043
Minimum	$0.00060	$0.00047	$0.000021
Maximum	$0.041	$0.032	$0.0015

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb. Table 44 shows the makeup water costs which were calculated for the U_3O_8 production projected for 2035. The first three cost estimates assume that a single type of uranium recovery facility would be responsible for producing all of the projected U_3O_8, while the last estimates assume that a mix of uranium recovery type facilities is used, as described in Section 6.2.6.

Table 44: Projected Annual Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$102,630	$80,489	$3,660	$88,979
Median	Reference Nuclear	$93,500	$73,329	$3,334	$81,063
Minimum	Low Nuclear Production	$4,366	$3,424	$156	$3,780
Maximum	Reference Low Import	$443,678	$347,963	$15,821	$381,053

Table 18 (page 75) shows the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projections. Table 45 compares those total U_3O_8 production costs to the costs for maintaining 1 meter of water in the impoundments given in Table 44. As Table 45 shows, the cost to maintain 1 meter of water in the impoundments is much less than 1% of the total cost to produce U_3O_8 for all four cases analyzed.

Table 45: Comparison of Cost to Maintain 1 Meter of Water in the Impoundments to Total U_3O_8 Production Cost

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)		1 Meter Water Contribution
	Total Annual (Table 18)	1 Meter Water (Table 44)	
Conventional	$398	$0.103	0.026%
In-Situ Leach	$411	$0.080	0.019%
Heap Leach	$356	$0.004	0.001%
Mixed Facilities	$396	$0.089	0.022%

Total Annual Benefits from Maintaining 1 Meter of Water

By requiring a minimum of 1 meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)} \quad (6\text{-}1)$$

Where:
- A = Radon attenuation factor (unitless)
- λ = Radon-222 decay constant (sec^{-1})
  = 2.1×10^{-6} sec^{-1}
- D = Radon diffusion coefficient (cm^2/sec)
  = 0.003 cm^2/sec in water
- d = Depth of water (cm)
  = 100 cm

Solving the above equation shows that 1 meter of water has a radon attenuation factor of about 0.07. To demonstrate the impact that a 1-meter water cover would have, the doses and risks reported in Section 4.4, Table 13 (page 49), have been recalculated. In this recalculation, it was assumed that an additional 1 meter of water covered all of the radon sources. Table 46 shows the results of this recalculation, in terms of the dose and risk reduction attributable to covering the

source area with 1 meter of water. Table 46 shows both the original radon release (as reported in Table 13, page 49) and the radon release after the source area has been covered with 1 meter of water.

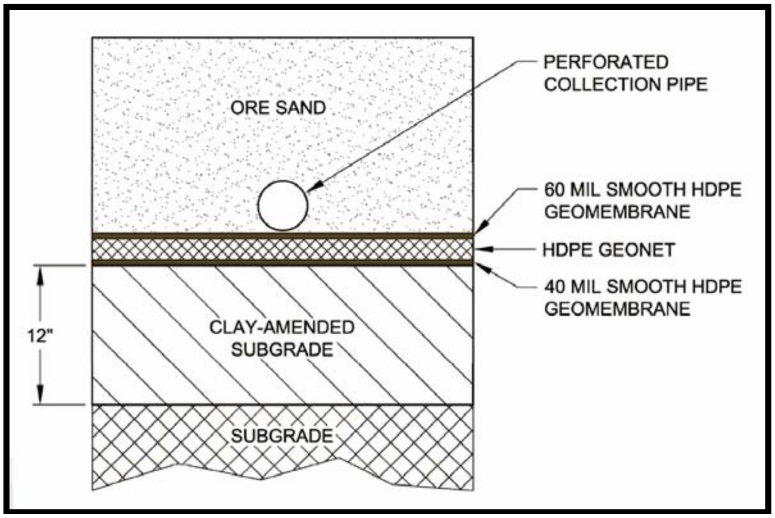
Table 46: Annual Dose and Risk Reduction from Maintaining 1 Meter of Water in the Impoundments

Uranium Site	Radon Release (Ci/yr)		Annual Dose Reduction		LCF[(a)] Risk Reduction (yr^{-1})	
	Table 13	1 Meter Water	Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	147	0.5	1.1	2.7E-06	5.6E-07
White Mesa	1,750	124	4.8	11.1	3.2E-05	5.9E-06
Smith Ranch - Highlands	36,500	2,590	3.4	1.4	2.1E-05	7.2E-07
Crow Butte	8,885	630	2.5	3.1	1.6E-05	1.6E-06
Christensen/Irigaray	1,600	114	3.5	1.8	2.2E-05	9.2E-07
Alta Mesa	740	52	20.1	10.7	1.2E-04	5.7E-06
Kingsville Dome	6,958	494	53.9	10.5	3.5E-04	5.7E-06

* LCF = latent cancer fatalities

6.3.4 Liners for Heap Leach Piles

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap piles. Figure 26 shows a typical design of a heap leach pile double liner. Although Figure 26 shows a clay-amended layer beneath the double liner, for the reasons given in Section 6.3.2, this cost estimate has assumed that a GCL would be used beneath the double liner, as shown in Figure 24.



Source: Titan 2011

Figure 26: Typical Heap Pile Liner

Double Liner Unit Costs

The unit costs for installing a double liner, with a leakage collection system, to a heap leach pile are assumed to be the same as the units costs developed in Section 6.3.2 for nonconventional impoundments.

The base heap leach facility utilizes a conveyor to deliver crushed material to the pile (Titan 2011). However, if material is delivered to the pile by truck, then the truck would put additional stress on the liner. Additional costs would be incurred to protect the liner from the additional stress. Because this analysis uses a range of liner unit costs, the additional costs for protecting the liner if truck loading is employed have been enveloped.

Total Cost of Heap Leach Pile Double Liner

Section 6.2.2 base heap leach facility (i.e., Sheep Mountain in Wyoming) includes two 80-acre heap piles. Using the same method described for the nonconventional impoundment (page 96), it was estimated that 90.3 acres of material would be required for the upper liner and drainage (Geonet) layer, and 89.6 acres of material for the lower liner and GCL. With these quantities of material and the unit costs from Section 6.3.2, Table 47 presents the median, minimum, and maximum capital and installation costs for installing the double liner beneath the two 80-acre heap piles.

Table 47: Heap Pile Double Liner Capital and Installation Costs

Cost Type	Capital and Installation Cost
Mean	$25,200,000
Median	$20,600,000
Minimum	$11,900,000
Maximum	$60,700,000
Mean, w/o Upper Liner	$12,900,000

Table 47 includes capital and annual cost estimates for a Mean, w/o Upper Liner case. This case was added because even if not required to meet the requirements at 40 CFR 192.32(a)(1), the design of the heap leach pile would include at least a single liner to collect the lixiviant flowing out of the heap. The reason is that since the lixiviant flowing out of the heap contains the uranium, it is in the licensee's economic interest to recover as much of it as possible, and since the rinsing liquid would be mixed with the lixiviant, it too would be recovered. Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

To demonstrate the individual component contribution to the total capital and installation cost, Table 48 presents a breakdown by component of the calculated mean capital and installation cost.

Table 48: Mean Heap Pile Double Liner Capital Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Heap Pile Double Liner Capital Cost
Upper Liner	$0.95	$3,730,077
Drainage (Geonet)	$0.64	$2,505,687
Lower Liner	$0.95	$3,702,230
GCL	$0.66	$2,579,315
Design & Engineering	20%	$2,503,462
Contractor Oversight	20%	$2,503,462
Overhead & Profit	20%	$3,504,847
Contingency	20%	$4,205,816
Total	—	$25,234,896

Table 49 presents the heap pile double liner annual cost estimates. The total annual cost is the sum of the annualized capital and installation cost and the annual O&M cost. The annualized capital cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of the heap leach facility, and then multiplying by the amount of U_3O_8 produced annually. The U_3O_8 annual production was based on 2035 projections made in Section 6.2.6.

Table 49 presents two cases. In the first case, it was assumed that all of the U_3O_8 required in 2035 would be produced by heap leach facilities, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 49: Heap Pile Double Liner Annual Costs

Case	Cost Type	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost
Heap Only	Mean	$15,100,000	$220,000	$15,300,000
	Median	$12,300,000	$180,000	$12,500,000
	Minimum	$6,700,000	$60,000	$6,800,000
	Maximum	$51,100,000	$1,340,000	$52,400,000
	Mean, w/o Upper Liner	$7,700,000	$110,000	$7,800,000
Mix	Mean	$340,000	$5,000	$350,000
	Median	$280,000	$4,000	$280,000
	Minimum	$160,000	$1,000	$160,000
	Maximum	$1,600,000	$43,000	$1,600,000
	Mean, w/o Upper Liner	$170,000	$3,000	$170,000

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for installing a double liner under the heap leach pile is about 4% of the total cost of heap leach U_3O_8 production (i.e., $15.3 million/$356 million), while the cost to change from a single liner to a double liner is about 2% of the total cost of heap leach U_3O_8 production (i.e., $7.8 million/$356 million).

Finally, the Section 6.2.2 base heap leach facility design includes a double liner, with drainage layer (Geonet) collection system, as shown in Figure 26. Thus, there is no additional cost for the Section 6.2.2 base heap leach facility to meet the design and construction requirements at 40 CFR 192.32(a)(1).

Benefits from a Double-Lined Heap Leach Pile

Including a double liner in the design of all heap leach piles would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, it is important for decision makers to consider this benefit because of the significance of ground water as a source of drinking water.

6.3.5 Maintaining Heap Leach Piles at 30% Moisture

As described in Section 5.4, the goal of this GACT is to maintain 30% moisture content in the heap leach pile so that the radon flux will be no larger than the flux from dry ore.

Simply adding water to the surface of the heap leach pile will replenish and maintain the moisture content in the surface layer. The moisture content in the remainder of the heap leach

vertical profile will be a function of the ore materials ability to retain moisture. The field moisture capacity of any earthen material is a function of the grain size and the mineralogy of the materials. Accordingly, the 30% moisture content should be attained with all low grade ore materials, due to the presence of significant fine-grained materials. Furthermore, it may not be necessary to maintain the entire pile at 30% moisture content, but only the upper portion of the pile. The exact depth to which the 30% moisture content requirement would apply would be determined on a site by site basis. The cost to supply the water to replenish the pile's moisture content has been estimated below.

It is also recognized that imposing a 30% moisture content requirement on the pile might (and likely, would) require certain design changes to the pile. Principal concerns to be addressed during pile design are slope stability and the liquefaction potential. Regarding slope stability, many leach piles are provided with containment dikes which provide structural support to the pile. The 30% moisture content requirement will have little or no effect on the moisture associated with the containment dikes, and thus the dikes would continue to provide support. Additionally, the pile design may be altered to increase its stability. For example, lower slopes, higher confinement dikes, the construction of stair-step pad grade, or the installation of textured (as opposed to smooth) geomembrane liner in critical areas would enhance pile stability.

Regarding liquefaction potential, it has been estimated that liquefaction is unlikely if the degree of saturation in the pile is less than about 85% (Sassa 1985, as referred to in Smith 2002, Thiel and Smith 2004). Assuming a 2.7 ratio between moisture content and saturation (NRC 1984), the 30% moisture content require translates into 81% saturation, which is slightly below the level required for liquefaction. Needless to say, with the increase in the saturation that will result from the imposition of the 30% moisture content requirement, more attention will need to be paid to the pile design to minimize the liquefaction potential.

The costs associated with these design changes have not been included in the following cost estimate because any design change would depend very much on the site's characteristics, and in many cases the design change might be inexpensive to implement if it is identified during the design phase. For example, using a textured rather than smooth liner, constructing higher containment dikes, and using stair-step pad grade could all be incorporated into the pile's design at minimal, if any, additional cost.

Unit Water Cost

The unit costs for providing water to a heap leach pile are assumed to be the same as the unit costs developed in Section 6.3.3 (page 100) for providing water to nonconventional impoundments.

Cost of Soil Moisture Meters

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors (Irrometer 2010). The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft) (Ben Meadows 2012).

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair (Spectrum 2011, Spectrum 2012).

Total Annual Cost to Maintain 30% Moisture in the Heap Leach Pile

The only cost associated with maintaining the moisture level within the pile is the cost of the water. It is assumed that existing piping (used to supply lixiviant to the pile during leaching) would be used to supply water necessary for maintaining the moisture level. Also, it is assumed that the in-soil method for moisture monitoring would be used, and that the above costs are insignificant. Finally, it is assumed that moisture readings would be performed during the daily inspections of the heap pile (Visus 2009), with no additional workhours.

The base heap leach facility includes a heap pile that will occupy up to 80 acres at a height of up to 50 ft. With an assumed porosity of 0.39 (see Section 5.1.5, page 56) and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 50 presents the calculated cost for makeup water to maintain the moisture level in the heap pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates derived in Section 6.3.3 were used for this estimate.

Table 50: Heap Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of makeup water in perspective, during leaching and rinsing of the pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2) (Titan 2011), or about 4,220 in/yr. This application rate is almost two orders of magnitude larger than the mean net evaporation rate, and is over a factor of 40 larger than the maximum net evaporation rate, shown in Table 50, and should be sufficient to maintain the moisture content within the pile

Section 6.2.6 and Table 25 (page 89) present projections of the U_3O_8 production for the year 2035. Table 51 presents the annual cost for makeup water to maintain the heap pile's moisture content. Table 51 presents two cases. In the first case, Heap Only, it was assumed that heap leach facilities would produce all of the U_3O_8 required in 2035, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 51: Projected Annual Heap Pile Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)	
		Heap Only	Mix
Mean	Reference Nuclear	$15,000	$300
Median	Reference Nuclear	$14,000	$300
Minimum	Low Nuclear Production	$650	$20
Maximum	Reference Low Import	$66,000	$2,100

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for maintaining 30% moisture in the heap leach pile is well under 1% of the total cost of heap leach U_3O_8 production (i.e., $15,000/$356,000,000).

Total Annual Benefits from Maintaining 30% Moisture in the Heap Leach Pile

By requiring a minimum 30% by weight moisture content in the heap leach pile, the release of radon from these piles would be reduced by up to about a factor of 2½, as shown in Figure 15. From the base case production profile (BRS 2011, page 86), it can be determined that the heap pile ore has a mean U-238 concentration of 213 pCi/g, and a range of 135 to 321 pCi/g. Assuming the normalized radon flux from a heap pile with 30% moisture content is 1 pCi/(m^2-sec) per pCi/g Ra-226, and that the Ra-226 is in equilibrium with the U-238, then the mean annual radon release from the 80-acre heap pile would be 2,180 Ci/yr. A comparable annual radon release from a dryer heap pile could be as high as 5,450 Ci/yr. Table 52 shows a comparison of annual doses and risks using these heap pile annual radon releases and the release to dose/risk relationship for the Western Generic site from Table 13.

Table 52: Annual Dose and Risk Comparison for Maintaining 30% Moisture Content in the Heap Pile

Heap Pile Moisture Content (by Weight)	Radon Release (Ci/yr)	Annual Dose		LCF[(a)] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
>30%	2,180	6.3	7.5	3.4E-04	9.6E-06
<30%	5,450	16	19	8.4E-04	2.4E-05

* LCF = latent cancer fatalities

Of course the exact reduction will depend upon the specific heap pile. For example, if a heap pile is operating at 20% moisture content without the GACT, then according to Figure 15, imposing the GACT would result in a radon flux reduction of about a factor of 1.6. Also, as Figure 14 shows, the response of the radon emanation coefficient to increasing moisture is very dependent on the material. This relationship between the emanation coefficient, moisture content, and material also influences the amount of reduction provided by the GACT.

6.3.6 Summary of Proposed GACT Standards Economic Assessment

Sections 6.3.2 through 6.3.5 presents the details of the economic assessment that was performed for implementing each of the four proposed GACT standards. **Table 53** presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, **Table 53** presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of **Table 53**.

Table 53: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	—	—	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the **Table 53**, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

Included in the Section 6.2 descriptions is the operational duration and amount of uranium produced by each reference facility. This information from Section 6.2 has been used to calculate an annual U_3O_8 production rate for each type facility, which in turn has been coupled with the unit costs provided in **Table 53**, to generate the annual cost for implementing each GACT at each reference facility. These annual costs are presented in **Table 54**. Again for comparison the baseline cost (without the GACTs) is provided at the bottom of **Table 54** for each type facility.

Table 54: Proposed GACT Standards Reference Facility Annual Costs

	Reference Facility Annual Cost ($/yr)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$410,000	$2,900,000	$230,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$5,300	$9,700	$1,100
GACT – Liners for Heap Leach Piles	—	—	$2,100,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4,500
GACTs – Total for All Four	$420,000	$2,900,000	$2,300,000
Baseline Facility Costs	$21,000,000	$49,000,000	$48,000,000

Based on EIA (EIA 2011a) nuclear power productions, Section 6.2.6 estimated the U.S. U_3O_8 productions until the year 2035. Using those EIA-based production estimates for 2011 and 2035 and the unit cost values from **Table 53**, **Table 55** presents the estimated national annual cost for implementing the proposed GACTs.

Table 55: Proposed GACT Standards National Annual Costs

	National Annual Cost ($1,000/yr)			
	2011 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,500	$12,000	$0	$15,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$45	$40	$0	$85
GACT – Liners for Heap Leach Piles	—	—	$0	$0
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0	$0
GACTs – Total for All Four	$3,600	$12,000	$0	$15,000
Baseline Facility Costs	$180,000	$200,000	$0	$380,000
	2035 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,300	$11,000	$230	$14,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$42	$37	$1.1	$80
GACT – Liners for Heap Leach Piles	—	—	$2,100	$2,100
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4.5	$4.5
GACTs – Total for All Four	$3,300	$11,000	$2,300	$17,000
Baseline Facility Costs	$160,000	$190,000	$48,000	$400,000

Since no facilities were operating, it was assumed that all 2011 U_3O_8 production was divided between conventional and ISL facilities with the 2009 ratio, as shown in Table 25 (i.e., 47.3% conventional and 52.7% ISL). As described in Section 6.2.6, for 2035 it was assumed that one

heap leach facility would be operational, and that the remainder of the U_3O_8 production would be divided between conventional and ISL facilities with the 2009 ratio.

Of course, if the amount of U_3O_8 produced by each type facility changes the annual cost to implement the GACTs changes as well. For example if in 2035 all U_3O_8 is produced by ISL facilities, then the national annual cost to implement the GACTs would increase from $17 million (as shown in **Table 55**) to $24 million. Alternatively, if all 2035 U_3O_8 is produced by conventional facilities, then the national annual cost to implement the GACTs would decrease to $8.1 million. Because the baseline U_3O_8 production costs are fairly constant across all three types of uranium recovery facilities (see **Table 53** and Sections 6.2.1 through 6.2.4), the 2035 baseline U_3O_8 production national annual cost would remain fairly constant around $400 million, regardless of how the U_3O_8 is produced.

Table 56 presents the national cost for the implementation of the four proposed GACTs summed over the years 2011 to 2035. As with the **Table 55** annual national costs, the **Table 56** summed national costs are based on EIA (EIA 2011a) nuclear power productions, as described in Section 6.2.6.

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Non-Discounted			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$81,000	$270,000	$5,800	$350,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$1,000	$910	$27	$2,000
GACT – Liners for Heap Leach Piles	—	—	$52,000	$52,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$110	$110
GACTs – Total for All Four	$82,000	$270,000	$58,000	$410,000
Baseline Facility Costs	$4,000,000	$4,600,000	$1,200,000	$9,800,000
	Discounted @3%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$58,000	$190,000	$4,100	$250,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$740	$650	$19	$1,400
GACT – Liners for Heap Leach Piles	—	—	$37,000	$37,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$80	$80
GACTs – Total for All Four	$59,000	$190,000	$41,000	$290,000
Baseline Facility Costs	$2,900,000	$3,300,000	$850,000	$7,000,000

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Discounted @ 7%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$40,000	$130,000	$2,900	$170,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$510	$450	$13	$970
GACT – Liners for Heap Leach Piles	—	—	$26,000	$26,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$55	$55
GACTs – Total for All Four	$41,000	$130,000	$29,000	$200,000
Baseline Facility Costs	$2,000,000	$2,300,000	$590,000	$4,800,000

As with the **Table 55** annual national costs, if the amount of U_3O_8 assumed to be produced by each type facility changes the **Table 56** summed national costs to implement the GACTs changes as well. For example if all U_3O_8 is produced by ISL facilities, then the non-discounted summed national cost to implement the GACTs would increase from $410 million (as shown in **Table 56**) to $590 million. Alternatively, if all U_3O_8 is produced by conventional facilities, then the non-discounted summed national cost to implement the GACTs would decrease to $200 million. Similar to the baseline annual national costs, the baseline U_3O_8 production non-discounted summed national cost would remain around $9.8 billion, regardless of how the U_3O_8 is produced.

6.4 Environmental Justice

Concerning environmental justice, EPA's economic assessment guidelines state:

> *Distributional analyses address the impact of a regulation on various subpopulations. Minority, low-income and tribal populations may be of particular concern and are typically addressed in an environmental justice (EJ) analysis. Children and other groups may also be of concern and warrant special attention in a regulatory impact analysis.* [EPA 2010, Section 10]

6.4.1 Racial Profile for Uranium Recovery Facility Areas

This section presents information on the racial (e.g., tribal populations) and economic (e.g., low income) profiles of the areas surrounding existing and proposed uranium recovery facilities.

Table 57 presents the racial profiles in the immediate areas (i.e., counties) surrounding the existing and proposed uranium recovery facilities, while Table 58 presents the profiles in the surrounding regional area (i.e., states) and on a national basis. A comparison of Table 57 to Table 58 indicates whether the racial population profile surrounding the uranium recovery facilities conform to the national and/or regional norms.

Table 57: Racial Profile for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	White	Black	Native American	Others
Juan Tafoya	Conventional	McKinley, NM	22.2%	0.4%	75.4%	2.0%
White Mesa Mill	Conventional	San Juan, UT	42.7%	0.1%	55.8%	1.3%
Grants Ridge	Heap Leach	Cibola, NM	56.2%	1.0%	40.9%	1.8%
Sheep Mountain	Heap Leach	Fremont, WY	78.3%	0.1%	19.8%	1.8%
Crow Butte	In-Situ Leach	Dawes, NE	94.5%	0.9%	3.0%	1.6%
Piñon Ridge	Conventional	Montrose, CO	96.6%	0.4%	1.4%	1.7%
Sweetwater Mill	Conventional	Sweetwater, WY	96.3%	0.8%	1.1%	1.9%
Christensen / Irigaray	In-Situ Leach	Campbell, WY	97.4%	0.2%	1.0%	1.4%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	97.5%	0.1%	1.0%	1.4%
Shootaring Canyon	Conventional	Garfield, CO	97.2%	0.5%	0.8%	1.6%
Kingsville Dome	In-Situ Leach	Kleberg, TX	92.8%	3.9%	0.8%	2.6%
Goliad	In-Situ Leach	Goliad, TX	93.6%	5.0%	0.7%	0.7%
Palangana	In-Situ Leach	Duval, TX	98.3%	0.6%	0.7%	0.4%
Alta Mesa	In-Situ Leach	Brooks, TX	98.8%	0.4%	0.6%	0.3%

Source: http://www.census.gov/popest/counties/asrh/

Table 58: Regional and National Racial Profiles

State		White	Black	Native American	Others
New Mexico	NM	85.4%	2.1%	9.8%	2.7%
Wyoming	WY	95.1%	0.8%	2.3%	1.8%
Utah	UT	94.0%	0.9%	1.4%	3.7%
Colorado	CO	90.7%	4.0%	1.2%	4.1%
Nebraska	NE	92.7%	4.1%	0.9%	2.3%
Texas	TX	83.7%	11.8%	0.7%	3.9%
United States	US	81.1%	12.7%	0.9%	5.3%

Source: http://www.census.gov/popest/counties/asrh/

At 10 of the 15 sites, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is White exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either Black or Other is less than the national norm, while the percentage of Blacks and Others is less than the regional norm at all but one site.

For all of the sites considered together, the data in Table 57 do not reveal a disproportionately high incidence of minority populations being located near uranium recovery facilities. However, certain individual sites may be located in areas with high minority populations. Those sites would need to be evaluated during their individual licensing processes.

6.4.2 Socioeconomic Data for Uranium Recovery Facility Areas

Table 59 shows the socioeconomic data for the immediate areas (i.e., counties) surrounding the existing and planned uranium recovery facilities. Specifically, the socioeconomic data shown in Table 59 is the fraction of land that is farmed, the value of that farmland, and the nonfarm per capita wealth. The percentages shown next to the value of that farmland and the nonfarm per capita wealth indicate where the site ranks when compared to all other counties in the United States.

Table 59: Socioeconomic Data for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	Farm Land	Farm Value Per Hectare		Per Capita Nonfarm Wealth	
White Mesa Mill	Conventional	San Juan, UT	31.1%	$670	4.0%	$103,073	0.6%
Juan Tafoya	Conventional	McKinley, NM	90.9%	$185	0.0%	$115,603	1.9%
Alta Mesa	In-Situ Leach	Brooks, TX	72.8%	$1,423	13.2%	$117,693	2.2%
Grants Ridge	Heap Leach	Cibola, NM	58.2%	$378	0.7%	$118,862	2.4%
Palangana	In-Situ Leach	Duval, TX	74.1%	$1,792	17.5%	$132,493	6.9%
Crow Butte	In-Situ Leach	Dawes, NE	88.0%	$895	6.9%	$144,291	15.1%
Kingsville Dome	In-Situ Leach	Kleberg, TX	0.0%	$1,478	13.9%	$149,865	20.4%
Goliad	In-Situ Leach	Goliad, TX	92.6%	$2,244	22.0%	$162,584	35.4%
Piñon Ridge	Conventional	Montrose, CO	23.3%	$2,916	30.1%	$181,133	59.5%
Sheep Mountain	Heap Leach	Fremont, WY	42.6%	$768	5.3%	$186,775	65.4%
Shootaring Canyon	Conventional	Garfield, CO	21.4%	$3,195	34.3%	$200,316	76.7%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	92.5%	$381	0.7%	$208,583	82.1%
Christensen/Irigaray	In-Situ Leach	Campbell, WY	97.3%	$437	1.1%	$225,858	89.3%
Sweetwater Mill	Conventional	Sweetwater, WY	22.2%	$242	0.1%	$232,504	91.2%

The discussion first focuses on the per capita nonfarm wealth. For comparison, the per capita nonfarm wealth in the United States ranges from $39,475 (Slope County, North Dakota) to $618,954 (New York County, New York). Table 59 shows that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are very well to do (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the 50th percentile in the United States. On the other hand, five sites are located in areas in which the per capita nonfarm wealth is below the country's 10th percentile.

Table 59 shows that eight of the sites have more than 50% of their land devoted to farming. However, the Table 59 farm value data show that the farmland for all 15 sites is below the 35th percentile farmland value in the United States. This could indicate that the farmland is of poor quality, or simply that the land is located in an economically depressed area. For comparison, farmland in the United States ranges in value from $185 per hectare (McKinley County, New Mexico, which is the location of the proposed Juan Tafoya uranium recovery facility) to $244,521 per hectare (Richmond County, New York).

For all of the sites combined, the data provided in Table 59 do not reveal a disproportionately high incidence of low-income populations being located near uranium recovery facilities. However, certain individual sites may be located within areas of low-income population. Those sites would need to be evaluated during their individual licensing processes.

6.5 Regulatory Flexibility Act

The Regulatory Flexibility Act requires federal departments and agencies to evaluate if and/or how their regulations impact small business entities. Specifically, the agency must determine if a regulation is expected to have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

If a rulemaking is determined to have a significant economic impact on a substantial number of small entities, then the agency must conduct a formal regulatory flexibility analysis. However, if the agency determines that a rulemaking does not have a significant economic impact on a substantial number of small entities, then it makes a certification of that finding and presents the analyses that it made to arrive at that conclusion.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with 40 CFR 192.32(a)(1) (see Section 5.4). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the agency is proposing to eliminate the distinction made in the 1989 rule between impoundments constructed pre-1989 and post-1989, since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored annually to demonstrate that the average Rn-222 flux does not exceed 20 pCi/(m^2-sec).

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are the White Mesa mill and the proposed Piñon Ridge mill owned by Energy Fuels; the Shootaring Canyon mill owned by Uranium One, Inc.; and the Sweetwater mill owned by Kennecott Uranium Co. . Of the three companies that own conventional mills, one, Energy Fuels, is classified as a small business, on the basis that they have fewer than 500 employees (EF 2012 states that Energy Fuels has 255 active employees in the U.S.).

Energy Fuels' White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full, it will be contoured and covered. Then, a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings.

Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Section 5.4 describes the proposed GACTs. Because both the White Mesa mill and the proposed Piñon Ridge mill are in compliance with the proposed GACT, it can be concluded that the rulemaking will not impose any new economic impacts on small business (i.e., Energy Fuels). For White Mesa, the proposed rule will actually result in a cost saving as Energy Fuels will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in 40 CFR 192.32(a)(1) and that a minimum depth of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to ISL facilities and heap leach facilities. Currently, there are six operating ISLs (as shown in Table 8) and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco; Alta Mesa owned by Mestena Uranium, LLC; Willow Creek owned by Uranium One, Inc.; and Hobson and La Palangana owned by Uranium Energy Corp. Again, using the criterion of fewer than 500 employees, Mestena Uranium, LLC, and Uranium Energy Corp. are small businesses, while both Cameco and Uranium One, Inc., which is owned by Rosatom, are large businesses.

All of the evaporation ponds at the four conventional mills and the six ISLs were built in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

In addition to the operating ISLs listed above, Table 9 shows that there are nine ISLs have been proposed for licensing. These are: Dewey Burdock owned by Powertech Uranium Corp.; Nichols Ranch owned by Uranerz Energy Corp.; 'Jab and Antelope' and Moore Ranch owned by Uranium One Americas, Inc., a subsidiary of Rosatom; Church Rock and Crownpoint owned by Hydro Resources, Inc. a subsidiary of Uranium Resources, Inc.; Ross owned by Strata Energy Inc., a subsidiary of Australian-based Peninsula Energy Limited; Goliad owned by Uranium Energy Corp.; and Lost Creek owned by Lost Creek ISR, LLC a subsidiary of Ur-Energy. All of these companies, except Rosatom, are small businesses.

According to the licensing documents submitted by the owners of the proposed ISLs, all will be constructed in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and while in standby status.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. Considering that the current (i.e., January 30, 2012) price

of U_3O_8 is $52 per pound (UxC 2012), this cost does not pose a significant impact to any of these small entities.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30-percent moisture content by weight during operations. Although no heap leach facilities are currently licensed, the small business Energy Fuels is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that has been presented (Titan 2011), the Energy Fuels facility will have an evaporation pond, a collection pond, and a raffinate pond. All three ponds will be double lined with leak detection. Based on the unit and facility cost comparisons presented in **Table 53** and **Table 54**, respectively, the implementation of the proposed GACTs at a heap leach facility (such as Sheep Mountain) would increase the U_3O_8 production cost by about 5%. Based on this small increase, the Sheep Mountain Project would: 1) remain competitive with U_3O_8 production cost for other types of facilities, and 2) continue to provide Energy Fuels with a profit. Energy Fuels is the only entity known to be preparing to submit a license application for a heap leach facility.

Of the 20 uranium recovery facilities identified above, 13 are owned by small businesses. As documented above in this report, those 13 facilities are either already in compliance with the proposed GACTs, with no additional impact, or compliance with the GACTs would not pose a significant impact to any of the small businesses (e.g., $52.03 lb^{-1} versus $52 lb^{-1}). Thus, after considering the economic impacts of this proposed rule on small entities, it is concluded that this action will not have a significant economic impact on a substantial number of small entities.

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Reid Rosnick	To	
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Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250)

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
February 2014

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ACRONYMS AND ABBREVIATIONS

ACE	Army Corps of Engineers
AEA	Atomic Energy Act
AIRDOS	AIR DOSe
ALARA	as low as reasonably achievable
AMC	American Mining Congress
ANPR	Advance Notice of Proposed Rulemaking
$BaCl_2$	barium chloride
BEIR	Biological Effects of Ionizing Radiation
BID	background information document
CAA	Clean Air Act
CAP88	Clean Air Act Assessment-1988
CFR	*Code of Federal Regulations*
CHP	certified health physicist
Ci/yr	curies per year
cm	centimeter
cm/sec	centimeter per second
cm^2/sec	square centimeter per second
CPI	consumer price index
CPP	Central Processing Plant
DARTAB	Dose And Risk TABulation
DOE	Department of Energy
EDF	Environmental Defense Fund
EIA	Energy Information Administration
EIS	environmental impact statement
EPA	Environmental Protection Agency
E-PERM	Electric Passive Environmental Radon Monitor
FGR	Federal Guidance Report
FR	*Federal Register*
ft	feet
g/cc	gram per cubic centimeter
G&A	general and administrative

GACT	generally available control technology
GCL	geosynthetic clay liner
GHG	Greenhouse Gas
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HRTM	Human Respiratory Tract Model
ICRP	International Commission on Radiological Protection
in/yr	inches per year
ISL	in-situ leach
ISR	in-situ recovery
km	kilometer
L	liter
LAACC	large-area activated charcoal collector
lb	pound
LCF	latent cancer fatalities
L/d	liters per day
LLDPE	linear low-density polyethylene
LoC	line of credit
m^2	square meters
m^3/hr	cubic meters per hour
m/sec	meters per second
MACT	maximum achievable control technology
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mi	mile
MIR	maximum individual risk
mph	miles per hour
mrem	millirem
mSv	millisievert
N.C.	not calculated
NESHAP	National Emission Standard for Hazardous Air Pollutants

N.G.	not given
NMA	National Mining Association
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
O&M	operation and maintenance
ORISE	Oak Ridge Institute for Science and Education
pCi	picocurie
pCi/(ft^2-sec)	picocurie per square foot per second
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/(m^2-sec)	picocurie per square meter per second
PIPS	passive implanted planar silicon
POO	Plan of Operation
PVC	polyvinyl chloride
R&D	research and development
Ra	radium
RADRISK	RADiation RISK
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent in man
RMEI	reasonably maximally exposed individual
Rn	radon
RSO	radiation safety officer
SC	Sierra Club
SF	square foot
tpd	tons per day
U	uranium
U_3O_8	triuranium octoxide
UMTRCA	Uranium Mill Tailings Remedial Control Act
WCS	Waste Control Specialists, LLC
WL	working level
WLM	working level month
ZnS(Ag)	silver doped zinc sulfide

1.0 EXECUTIVE SUMMARY

The purpose of this report is to present the reader with an understanding of the facilities being regulated under this National Emission Standard for Hazardous Air Pollutant (NESHAP). The report also presents the technical bases that the Environmental Protection Agency (EPA or the Agency) has used for evaluating the risks from existing facilities and for determining that the prescribed work practice standards represent generally available control technology (GACT), as required by section 112(d) of the 1990 amendments to the Clean Air Act (CAA).

The Agency is also defining the scope of its review of the Subpart W NESHAP to include the waste impoundments at in-situ leach (ISL) uranium recovery facilities and heap leach recovery operations, since all post-1989 impoundments, which potentially contain uranium byproducts, are considered to be under the NESHAP. The Agency has defined the scope of the review to include regulation of the heap leach pile, as it believes the pile contains byproduct material during operations.

1.1 Introduction, History, and Basis

After a brief introduction, this report describes the events that led the Agency to promulgate a NESHAP for radon emissions from operating uranium mill tailings on December 15, 1989, in Section 40 of the *Code of Federal Regulations* (40 CFR) Part 61, Subpart W. The 1977 amendments to the CAA include the requirement that the Administrator of EPA determines whether radionuclides should be regulated under the act. In December 1979, the Agency published its determination in the *Federal Register* (FR) that radionuclides constitute a hazardous air pollutant (HAP) within the meaning of section 112(a)(1). In 1979, the Agency also developed a background information document (BID) to characterize “source categories” of facilities that emit radionuclides into ambient air, and in 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID. On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings, establishing an emission standard of 20 picocuries per square meter per second (pCi/(m^2-sec)) for radon (Rn)-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. Between 1984 and 1986, the Environmental Defense Fund (EDF), the Natural Resources Defense Council (NRDC), the Sierra Club (SC), and the American Mining Congress (AMC) filed various court petitions seeking modifications to the NESHAPs.

In a separate decision, the U.S. District Court for the District of Columbia outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk, and then considering additional factors, such as costs to establish the “ample margin of safety.”

Section 112(q)(1) of the 1990 CAA Amendments requires that certain emission standards shall be reviewed, and if appropriate, revised to comply with the requirements of section 112(d). Subpart W is under review/revision in response to that requirement. Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. In accordance with section 112(d), the Administrator has

elected to promulgate standards that provide for the use of GACT or management practices to regulate radon emissions from uranium recovery facility tailings impoundments noted in Subpart W.

1.2 The Uranium Extraction Industry Today

From 1960 to the mid-1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. In the early years, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. Because of overproduction, the price of uranium rapidly declined in the 1980s. The declining uranium market could not support the existing number of uranium recovery operations, and many of the uranium recovery facilities in the United States were closed, decommissioned, and reclaimed. In the mid- to late 1980s, several uranium recovery projects employing the solution, or ISL, mining process came on line. However, because of a need for clean energy, a need to develop domestic sources of energy, and other reasons, current forecasts predict growth in the U.S. uranium recovery industry over the next decade and continuing into the future.

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. Representative of the extent of the conventional uranium milling operations that currently exist and are licensed in the United States are the mills at Sweetwater, Wyoming; Shootaring Canyon, Utah; and White Mesa, Utah. Only the White Mesa mill is currently in operation. A conventional mill at Piñon Ridge, Colorado, is currently in the planning and licensing stage. Additionally, a total of six potentially new conventional mill facilities are being discussed in New Mexico, Wyoming, Utah, and Arizona.

The radon data for the conventional mill tailings impoundments indicate that the radon exhalation rates from the surfaces are generally within the Subpart W standard of 20 pCi/(m^2-sec), but occasionally the standard may be exceeded. When that occurs, the tailings are usually covered with more soil, and the radon flux is reduced.

Solution, or ISL, mining is defined as the leaching or recovery of uranium from the host rock by chemicals, followed by recovery of uranium at the surface. ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects in the 1980s demonstrated solution mining to be a viable uranium recovery technique. Ten ISL facilities are currently operating (see Table 8, page 33), and about 23 other facilities are restarting, expanding, or planning for new operations.

Uranium is leached into solution through the injection into the ore body of a lixiviant. A lixiviant is a chemical solution used to selectively extract (or leach) uranium from ore bodies where they are normally found underground. The injection of a lixiviant essentially reverses the geochemical reactions that are associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. The liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. Since radium (Ra)-226 is present in the liquid bled from the lixiviant, radon will be generated in and released from the ISL's evaporation/holding ponds/ impoundments. The amount of radon released from these evaporation/holding ponds has been estimated and found to be small. (See Section 3.3.1.)

Heap leaching is a process by which chemicals are used to extract the economic element (for the purposes of Subpart W, uranium) from the ore. A large area of land is leveled with a small gradient, and a liner and collection system are installed. Ore is extracted from a nearby surface or underground mine and placed in heaps atop the liner. A leaching agent (usually an acid) will then be sprayed on the ore. As the leaching agent percolates through the heap, the uranium is mobilized and enters the solution. The solution will flow to the bottom of the pile and then along the gradient into collecting pools, from which it will be pumped to an onsite processing plant. In the past, a few commercial heap leach facilities operated but none is now operating. Planning and engineering have been undertaken for two heap leach facilities, one in Wyoming and the other in New Mexico.

A brief review of Method 115, "Monitoring for Radon-222 Emissions" (40 CFR 61, Appendix B) (SC&A 2008), demonstrated that its use can still be considered current for monitoring radon flux from conventional uranium tailings impoundments. It is not an option for measuring radon emissions from evaporation or holding ponds because there is no solid surface on which to place the monitors.

1.3 Current Understanding of Radon Risk

A description of how the understanding of the risk presented by radon and its progeny has evolved since the 1989 BID was published examines three parameters: (1) the radon progeny equilibrium fraction, (2) the epidemiological risk coefficients, and (3) the dosimetric risk coefficients. Additionally, SC&A (2011) used the computer code CAP88 version 3.0 (Clean Air Act Assessment Package-1988) to analyze the radon risk from eight operating uranium recovery sites, plus two generic sites.

The lifetime (i.e., 70-year) maximum individual risk (MIR)[1] calculated using data from eight actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments, while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments. (SC&A 2011)

To protect public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to a lifetime MIR of approximately 1 in 10 thousand (i.e., 10^{-4}). Although the calculated high end of the lifetime MIR range is above 10^{-4}, there are several mitigating factors. First, the highest MIR was calculated for a hypothetical mill at an eastern generic site. If an actual mill were to be located at the Eastern Generic site, it would be required to reduce its radon

[1] In this BID all risks are presented as mortality risks. If it is desired to estimate the morbidity risk, simply multiply the mortality risk by 1.39.

emissions as part of its licensing commitments. Also, the assumptions that radon releases occur continuously for 70 years and that the same reasonably maximally exposed individual (RMEI) is exposed to those releases for the entire 70 years are very conservative.

Likewise, the risk assessment estimated that the risk to the population from all eight real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 kilometers (km) of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km (50 miles) was 0.0043, which was less than one case every 200 years, for existing impoundments and 0.014, or approximately one case every 70 years, for new impoundments.

1.4 Evaluation of Subpart W Requirements

EPA has determined that radon releases from uranium recovery facilities are HAPs, as defined by the CAA. Furthermore, no radionuclide (including radon) releases have met the CAA's definition of major sources, and thus radon releases from uranium recovery facilities are classified as area sources. (See Section 5.3.) Under section 112(d) of the CAA, the EPA Administrator may elect to promulgate standards or requirements applicable to area sources that provide for the use of GACTs or management practices to reduce emissions of HAPs. For the four source categories of radon releases from uranium recovery facilities, the Administrator has elected to promulgate GACTs as follows:

Conventional Impoundments – Constructed on or before December 15, 1989

GACT The flux standard of 20 pCi/(m^2-sec) contained in the current 40 CFR 61.252(a) will no longer be required; require that these conventional impoundments be operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Conventional Impoundments – Constructed after December 15, 1989

GACT Retain the standard that conventional impoundments be designed, constructed, and operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Nonconventional Impoundments – Where uranium byproduct material (i.e., tailings) are contained in ponds and covered by liquids

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restrictions, and require that during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

Heap Leach Piles

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), and require that the moisture content of the operating heap be maintained at or greater than 30 percent.

Additionally, the analyses provided in this BID support the following findings:

- Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.
- By requiring that conventional impoundments be designed, constructed, and operated to meet one of two 40 CFR 61.252(b) work practices (i.e., phased disposal and continuous disposal), adoption of an emission limit (e.g., 20 pCi/(m^2-sec)) is not necessary to protect public health.
- The requirement that conventional impoundments use either phased or continuous disposal technologies is appropriate to ensure that public health is protected with an ample margin of safety, and is consistent with section 112(d) of the 1990 CAA Amendments that require standards based on GACT.
- The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures/facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

1.5 Economic Impacts

The economic impact analysis to support any potential revision of the Subpart W NESHAP is presented in four distinct areas:

(1) A review and summary of the original 1989 economic assessment and supporting documents are provided.

(2) The baseline economic costs for development of new conventional mills, ISL facilities, and heap leach facilities are developed and presented.

(3) The anticipated costs to the industries versus the environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

(4) Finally, information is provided on the economic impacts to disadvantaged and tribal populations and on environmental justice.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For conventional mills, data from the proposed new mill at the Piñon Ridge project in Colorado were used. Data from two proposed new ISL facilities were used; the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14 to 15-year production period,

which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Table 1 summarizes the unit cost (dollars per pound) estimates for all four uranium recovery facilities. As shown, on a unit cost basis, heap leach facilities are projected to be the least expensive, and the two ISL facilities the most expensive.

Table 1: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC	w/o LoC
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87

Because the four proposed GACTs are not expected to change the manner in which any of the uranium recovery facilities are designed, built, or operated, no additional economic benefits or costs are associated with the proposed Subpart W revisions.

At 10 of the 15 existing or proposed uranium recovery sites analyzed, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is white exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either African-American or Other is less than the national norm, while the percentage of African-Americans and Others is less than the regional norm at all but one site. The analysis found that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are more economically advantaged (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the United States' 50th percentile. On the other hand, five sites are located in areas where the per capita nonfarm wealth is below the country's 10th percentile.

2.0 INTRODUCTION, HISTORY, AND BASIS

On December 15, 1989, EPA promulgated a NESHAP for radon emissions from operating uranium mill tailings (40 CFR 61, Subpart W). Section 112(q) of the CAA, as amended, requires EPA to review, and if appropriate, revise or update the Subpart W standard on a timely basis (within 10 years of passage of the CAA Amendments of 1990). Soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically. However, recent developments in the market for uranium have led to some companies expressing their intention to pursue licensing of new facilities, and therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations before these proposed facilities become operational.

Two separate standards are defined in Subpart W. The first states that existing sources (facilities constructed before December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) or 1.9 picocuries per square foot per second (pCi/(ft^2-sec)) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA showing the results of the compliance monitoring. The second Subpart W standard prescribes that for new sources (facilities constructed on or after December 15, 1989), no new tailings impoundment can be built unless it is designed, constructed, and operated to meet one of the two following work practices:

(1) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) as determined by the U.S. Nuclear Regulatory Commission (NRC). The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

(2) Continuous disposal of tailings such that tailings are dewatered and immediately disposed of with no more than 10 acres uncovered at any time and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The work practice standard also applies to operations at existing sources, once their existing impoundments can no longer accept additional tailings.

The facilities covered by Subpart W are uranium recovery facilities, also licensed and regulated by the NRC or its Agreement States. The NRC becomes involved in uranium recovery operations once the ore is processed and chemically altered. This occurs either in a uranium mill (the next step from a conventional mine) or during ISL or heap leach. For this reason, the NRC regulates ISL facilities, as well as uranium mills and the disposal of liquid and solid wastes from uranium recovery operations (including mill tailings), but does not regulate the conventional uranium mining process. The NRC regulations for the protection of the public and workers from exposure to radioactive materials are found in 10 CFR 20, while specific requirements for the design and operation of uranium mills and disposition of tailings are found in 10 CFR 40, Appendix A.

2.1 Document Contents and Structure

This report is divided into six sections. The first two sections are the Executive Summary and this introduction, which includes discussions of the history of the development of Subpart W (Section 2.2) and the basis for the 1989 risk assessments (Section 2.3). Four technical sections, the contents of which are summarized below, follow this introductory section.

2.1.1 The Uranium Extraction Industry Today

After a brief history of the uranium market, Section 3.0 identifies both the uranium recovery facilities that are licensed today and those that have been proposed to be built in the future.

For currently existing impoundments, Section 3.0 presents the following information:

- Data on the configuration of current impoundments.
- Results of compliance monitoring.

Section 3.0 also presents a description of the Method 115 radon monitoring method.

2.1.2 Current Understanding of Radon Risk

Section 4.0 presents a qualitative analysis of the changes that have occurred in the understanding of the risks associated with Rn-222 releases from impoundments. Emphasis is on the changes to the predicted radon progeny equilibrium fractions and the epidemiological and dosimetric lifetime fatal cancer risk per working level (WL). Section 4.0 also discusses how the current analytical computer model, CAP88 Version 3.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Finally, Section 4.4 presents dose and risk estimates for several current uranium recovery facilities.

2.1.3 Evaluation of Subpart W

The evaluation of Subpart W requirements required the analyses of some key issues to determine if the current technology has advanced since the 1989 promulgation of the rule. The key issues include: existing and proposed uranium recovery facilities, Resource Conservation and Recovery Act (RCRA) comparison, regulatory history, tailings impoundment technologies, radon measurement methods, and risk assessment. Section 5.0 discusses these key issues, in order to determine whether the requirements of Subpart W are necessary and sufficient.

Based on the evaluation of the key issues and in keeping with section 112(d) of the CAA, Section 5.0 also presents GACT radon emission control standards for three categories of uranium recovery facilities:

(1) Conventional impoundments.

(2) Nonconventional impoundments, where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids.

(3) Heap leach piles.

In addition to the key issues, several issues that need clarification in order to be more fully understood are presented and described. The issues in need of clarification include extending monitoring requirements, defining when the closure period for an operating facility begins, interpretation of the term “standby,” the role of weather events, and monitoring reporting requirements.

2.1.4 Economic Impact Analysis

Section 6.0 of the document reviews and reassesses all the additional economic impacts that may occur due to the extension and revision of the Subpart W NESHAP and specifically addresses the following:

- A review and summary of the original 1989 economic assessment and supporting documents are provided.

- The baseline economic costs for the development of new conventional mills and ISL and heap leach facilities are developed and presented.

- The anticipated costs to industries versus environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

- Finally, information is provided relating to economic impacts on disadvantaged populations and tribal populations and to environmental justice.

2.2 History of the Development of the Subpart W NESHAP

The following subsections present a brief history of the development of environmental radiation protection standards by EPA, with particular emphasis on the development of radionuclide NESHAPs.

Table 2 presents a partial time line sequence of EPA's radiation standards with emphasis on the NESHAPs, including Subpart W.

Table 2: Partial Timeline of EPA's Radiation Standards

January 13, 1977	EPA publishes 40 CFR 190 – Environmental Protection Standards for Nuclear Power Operations.
August 1979	EPA publishes first BID, *Radiological Impacts Caused by Emission of Radionuclides into Air in the United States*, EPA 520/7-79-006.
December 27, 1979	EPA determines radionuclides constitute a HAP – (section 112(a)(1) amendments to the CAA.
January 5, 1983	EPA under UMTRCA promulgates, 40 CFR 192, Subpart B "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites," that for inactive tailings or after closure of active tailings, the radon flux should not exceed an average release rate of 20 pCi/(m^2-sec).
March 1983	EPA publishes draft report, *Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-83-001, and proposes radionuclide NESHAPs for: 1. DOE and Non-NRC-Licensed Federal Facilities. 2. NRC-Licensed Facilities. 3. Elemental Phosphorus Plants. 4. Underground Uranium Mines.
September 30, 1983	EPA issues standards under UMTRCA (40 CFR 192, Subparts D and E) for the management of tailings at locations licensed by the NRC or the States under Title II of the UMTRCA. These standards do not specifically limit Rn-222 emissions until after closure of a facility; however, they require ALARA procedures for Rn-222 control.
February 17, 1984	SC sues EPA (District Court for Northern California) and demands EPA promulgate final NESHAP rules for radionuclides or find that they do not constitute a HAP (i.e., "de-list"" the pollutant). In August 1984, the court grants the SC motion and orders EPA to take final actions on radionuclides by October 23, 1984.
October 22, 1984	EPA issues *Final Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-84-022-1and -2.
October 23, 1984	EPA withdraws the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities.

Table 2: Partial Timeline of EPA's Radiation Standards

December 1984	District Court finds EPA in contempt. EPA and SC submit motion to court with schedule (August 5, 1985). Court orders EPA to issue final standards for Rn-222 emissions from licensed uranium mills and mill tailings impoundments by May 1, 1986 (later moved to August 15, 1986).
February 6, 1985, to September 24, 1986	EPA promulgates NESHAPs for: 1. DOE Facilities (February 1985). 2. NRC-Licensed Facilities and Non-DOE Federal Facilities (February 1985). 3. Elemental Phosphorus Plants (February 1985). 4. On April 17, 1985, Rn-222 emissions from underground uranium mines added. 5. On September 24, 1986, Rn-222 from licensed uranium mill tailings added – 20 pCi/(m^2-sec) and the work practice standard for small impoundments or continuous disposal.
November 1986	AMC and EDF file petitions challenging the NESHAPs for operating uranium mills.
July 28, 1987	The Court of Appeals for the District of Columbia remanded to EPA the NESHAP for vinyl chloride (see text). Given the decision, EPA petitioned the court for a voluntary remand of standards and asked that the pending litigation on all issues relating to its radionuclide NESHAPs be placed in abeyance during the rulemaking. EPA also agreed to reexamine all issues raised by parties to the litigation. The court granted EPA's petition on December 8, 1987.
September 14, 1989	EPA promulgates NESHAPs for benzene, etc. Importantly, EPA establishes the "fuzzy bright line." That is, EPA's approach to residual risk under section 112 (as advanced in the Hazardous Organic NESHAPs and approved by the District of Columbia Circuit in *NRDC v. EPA*) as essentially establishing a "fuzzy bright line" with respect to carcinogens, whereby EPA must eliminate risks above one hundred in one million (1 in 10,000) , does not have to address risks below one in one million (1 in 1,000,000), and has discretion to set a residual risk standard somewhere in between (Jackson 2009). In a second step, EPA can consider whether providing the public with "an ample margin of safety" requires risks to be reduced further than this "safe" level, based on EPA's consideration of health information and other factors such as cost, economic impact, and technological feasibility (Jackson 2009).
September 1989	EPA publishes the NESHAPs for radionuclides. The agency prepared an EIS in support of the rulemaking. The EIS consisted of three volumes: Volume I, *Risk Assessment Methodology*; Volume II, *Risk Assessments*; and Volume III, *Economic Assessment.*
December 15, 1989	EPA promulgates NESHAPs for: • Subpart B: National Emission Standards for Radon Emissions from Underground Uranium Mines. • Subpart H: Emissions of Radionuclides Other than Radon from DOE Facilities. • Subpart I: National Emissions of Radionuclides Other than Radon from DOE Facilities by NRC and Federal Facilities Not Covered by Subpart H. • Subpart K: Radionuclide Emissions from Elemental Phosphorus Plants. • Subpart Q: Radon Emissions from DOE Facilities. • Subpart R: Radon Emissions from Phosphogypsum Stacks. • Subpart T: Radon Emissions from the Disposal of Uranium Mill Tailings. (rescinded effective June 29, 1994; published in the FR July 15, 1994). • Subpart W: Radon Emissions from Operating Uranium Mill Tailings Piles.
November 15, 1990	President signs the CAA Amendments of 1990. Part of the act requires that some regulations passed before 1990 be reviewed and, if appropriate, revised within 10 years of the date of enactment of the CAA Amendments of 1990. The amendments also instituted a technology-based framework for HAPs. Sources that are defined as large emitters are to employ MACT, while sources that emit lesser quantities may be controlled using GACT.

2.2.1 The 1977 Amendments to the Clean Air Act

On January 13, 1977 (FR 1977), EPA established environmental protection standards for nuclear power operations pursuant to its authority under the Atomic Energy Act (AEA). The standards in 40 CFR 190, which covered all licensed facilities that are part of the uranium fuel cycle, established an annual limit on exposure to members of the public. The NRC or its Agreement States, which licenses these facilities, has the responsibility for the enforcement of the Part 190 standards. Additionally, the NRC imposes the requirement that licensees keep all exposures "as low as reasonably achievable" (ALARA). The Part 190 standards exempted Rn-222 from the annual limit because of the uncertainties associated with the risk of inhaled radon.

After the promulgation of 40 CFR 190, the 1977 amendments to the CAA were passed. These amendments included the requirement that the Administrator of EPA determine whether radionuclides should be regulated under the CAA.

In December 1979, the Agency published its determination in the *Federal Register* (FR 1979) that radionuclides constitute a HAP within the meaning of section 112(a)(1). As stated in the FR, radionuclides are known to cause cancer and genetic defects and to contribute to air pollution that may be anticipated to result in an increase in mortalities or an increase in serious, irreversible, or incapacitating reversible illnesses. The Agency further determined that the risks posed by emissions of radionuclides into the ambient air warranted regulation and listed radionuclides as a HAP under section 112.

Section 112(b)(1)(B) of the CAA requires the Administrator to establish NESHAPs at a "level which (in the judgment of the Administrator) provides an ample margin of safety to protect the public health" or find that they are not hazardous and delist them.

2.2.2 Regulatory Activities between 1979 and 1987

To support the development of radionuclide NESHAPs, the Agency developed a BID to characterize "source categories" of facilities that emit radionuclides into ambient air (EPA 1979). For each source category, EPA developed information needed to characterize the exposure of the public. This included characterization of the facilities in the source category (numbers, locations, proximity of nearby individuals); radiological source terms (curies/year (Ci/yr)) by radionuclide, solubility class, and particle size; release point data (stack height, volumetric flow, area size); and effluent controls (type, efficiency). Doses to nearby individuals and regional populations caused by releases from either actual or model facilities were estimated using computer codes (see Section 2.3).

In 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID (EPA 1983). These four source categories were the Department of Energy (DOE) and non-NRC-licensed federal facilities, NRC-licensed facilities, elemental phosphorus plants, and underground uranium mines. For all other source categories considered in the BID (i.e., coal-fired boilers, the phosphate industry and other extraction industries, uranium fuel-cycle facilities, uranium mill tailings, high-level waste disposal, and low-energy accelerators), the Agency found that NESHAPs were not necessary. In reaching this conclusion, the Agency found that either the levels of radionuclide emissions did not cause a significant dose to nearby

individuals or the regional populations, the additional effluent controls were not cost effective, or the existing regulations under other authorities were sufficient to keep emissions at an acceptable level.

During the public comment period on the proposed NESHAPs, the Agency completed its rulemaking efforts under the Uranium Mill Tailings Remedial Control Act (UMTRCA) to establish standards (40 CFR 192) for the disposal of uranium mill tailings. With respect to the emission of Rn-222, the UMTRCA standards established a design standard calling for an Rn-222 flux rate of no more than 20 pCi/(m^2-sec).

In February 1984, the SC sued EPA in the U.S. District Court for Northern California (*Sierra Club v. Ruckelshaus*, No. 84-0656) (EPA 1989), demanding that the Agency promulgate final NESHAPs or delist radionuclides as a HAP. The court sided with the plaintiffs and ordered EPA to promulgate final regulations. In October 1984, EPA withdrew the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities, finding that existing control practices protected the public health with an ample margin of safety (FR 1984). EPA also withdrew the NESHAP for underground uranium mines, but stated its intention to promulgate a different standard and published an Advance Notice of Proposed Rulemaking (ANPR) to solicit additional information on control methods. It also published an ANPR for licensed uranium mills. Finally, the FR notice affirmed the decision not to regulate the other source categories identified in the proposed rule, with the exception that EPA was doing further studies of phosphogypsum stacks to see if a standard was needed.

In December 1984, the U.S. District Court for Northern California found EPA's action of withdrawing the NESHAPs to be in contempt of the court's order. Given the ruling, the Agency issued the final BID (EPA 1984) and promulgated final standards for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities in February 1985 (FR 1985a), and a work practice standard for underground uranium mines in April of the same year (FR 1985b).

The EDF, the NRDC, and the SC filed court petitions seeking review of the October 1984 final decision not to regulate the source categories identified above, the February 1985 NESHAPs, and the April 1985 NESHAP. The AMC also filed a petition seeking judicial review of the NESHAP for underground uranium mines.

On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings (FR September 24, 1986), which established an emission standard of 20 pCi/(m^2-sec) for Rn-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. One justifications for the work practices was that, while large impoundments did not pose an unacceptable risk during active operations, the cyclical nature of the uranium milling industry could lead to prolonged periods of plant standby and the risk that the tailings impoundments could experience significant drying, with a resulting increase in Rn-222 emissions. Furthermore, the Agency believed that the two acceptable work practices actually saved the industry from the significant costs of constructing and closing large impoundments before they were completely filled. With the promulgation of the NESHAP for operating uranium mill tailings, three EPA regulations covered the releases of radionuclides into

the air during operations and tailings disposal at uranium mills: 40 CFR 190; 40 CFR 192; and 40 CFR 61, Subpart W.

In November 1986, the AMC and the EDF filed petitions challenging the NESHAP for operating uranium mill tailings.

2.2.3 Regulatory Activities between 1987 and 1989

While the petitions filed by the EDF, NRDC, SC, and AMC were still before the courts, the U.S. District Court for the District of Columbia, in *NRDC v. EPA* (FR 1989b), found that the Administrator had impermissibly considered costs and technological feasibility in promulgating the NESHAP for vinyl chloride. The court outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk and then considering additional factors, such as costs, to establish the "ample margin of safety." Given the court's decision, the Agency reviewed how it had conducted all of its NESHAP rulemakings and requested that the court grant it a voluntary remand for its radionuclide NESHAPs. As part of an agreement with the court and the NRDC, the Agency agreed to reconsider all issues that were currently being litigated, and it agreed that it would explicitly consider the need for a NESHAP for two additional source categories: radon from phosphogypsum stacks and radon from DOE facilities. The subsequent reconsideration became known as the radionuclide NESHAPs reconsideration rulemaking.

2.2.4 1989 Radionuclide NESHAPs Reconsideration Rulemaking

In the radionuclide NESHAPs reconsideration rulemaking, the Administrator relied on a "bright line" approach for determining whether a source category required a NESHAP. This meant that no NESHAP was required if all individuals exposed to the radionuclide emissions from the facilities in the source category were at a lifetime cancer risk of less than 1 in 1,000,000, and less than 1 fatal cancer per year was estimated to be incurred in the population. For source categories that did not meet this "bright line" exclusion, the Agency adopted a two-step, multi-factor approach to setting the emission standards.

The first step established a presumptively acceptable emissions level corresponding to an MIR of about 1 in 10,000 lifetime cancer risk, with the vast majority of exposed individuals at a lifetime risk lower than 1 in 1,000,000, and with less than 1 total fatal cancer per year in the exposed population. If the baseline emissions from a source category met these criteria, they were presumed adequately safe. If they did not meet these criteria, then the Administrator was compelled by his nondiscretionary duty to determine an emission limit that would correspond to risks that were adequately safe.

After baseline emissions were determined to be adequately safe or an adequately safe alternative limit defined, the analysis moved to the second step, where reduced risks for alternative emission limits were evaluated, along with the technological feasibility and costs estimated to be associated with reaching lower levels. In the two-step approach, the Administrator retained the discretion to decide whether the NESHAP should be set at these lower limits.

2.2.5 1990 Amendments to the Clean Air Act

NESHAP Subpart W is under consideration for revision because section 112(q)(1) requires that certain emission standards in effect before the date of enactment of the 1990 CAA Amendments shall be reviewed and, if appropriate, revised to comply with the requirements of section 112(d). As stated previously, soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically, negating the need to perform the Subpart W review. However, as discussed in Section 3.1, recent developments in the market for uranium have led to forecasts of growth in the uranium market over the next decade and continuing for the foreseeable future. Therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations at this time, before facilities developed in response to those forecasts become operational.

Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. Section 112(c) lists radionuclides, including radon, as an HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for the regulation of emissions of HAPs.

The regulation of HAPs at major sources is dictated by the use of maximum achievable control technology (MACT). Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating an MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

EPA has determined that radon emissions from uranium recovery facility tailings impoundments are an area source and that GACT applies (see Section 5.3). The Senate report on the legislation (U.S. Senate 1989) contains additional information on GACT and describes GACT as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.*

Determining what constitutes a GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. It is also necessary to consider the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are considered to determine whether such technologies and practices could be generally available for the area source category at issue. Finally, as noted above, in determining GACTs for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

2.3 Basis for the Subpart W 1989 Risk Assessment and Results

In the 1989 NESHAP for operating uranium mill tailings, exposures and risks were estimated using a combination of actual site data for existing impoundments and model or representative facilities for future impoundments and computer models. The 1989 risk assessment reflected the estimated risks to the regional (0-80 km [0-50 mile]) populations associated with the 11 conventional mills that were operating or in standby[2] at that time. Mathematical models were developed to simulate the transport of radon released from the mill tailings impoundments and the exposures and risks to individuals and populations living near the mills. Those models were programmed into three computer programs for the 1989 risk assessment: AIRDOS-EPA, RADRISK, and DARTAB. The paragraphs that follow briefly discuss each of these computer programs.

AIRDOS-EPA was used to calculate radionuclide concentrations in the air, rates of deposition on the ground, concentrations on the ground, and the amounts of radionuclides taken into the body via the inhalation of air and ingestion of meat, milk, and vegetables. A Gaussian plume model was used to predict the atmospheric dispersion of radionuclides released from multiple stacks or area sources. The amounts of radionuclides that are inhaled were calculated from the predicted air concentrations and a user-specified breathing rate. The amounts of radionuclides in the meat, milk, and vegetables that people ingest were calculated by coupling the atmospheric transport models with models that predict the concentration in the terrestrial food chain.

RADRISK computed dose rates to organs resulting from a given quantity of radionuclide that is ingested or inhaled. Those dose rates were then used to calculate the risk of fatal cancers in an exposed cohort of 100,000 persons. All persons in the cohort were assumed to be born at the same time and to be at risk of dying from competing causes (including natural background radiation). RADRISK tabulated estimates of potential health risk due to exposure to a known quantity of approximately 500 different radionuclides and stored these estimates until needed. These risks were summarized in terms of the probability of premature death for a member of the cohort due to a given quantity of each radionuclide that is ingested or inhaled.

DARTAB provided estimates of the impact of radionuclide emissions from a specific facility by combining the information on the amounts of radionuclides that were ingested or inhaled (as provided by AIRDOS-EPA) with dosimetric and health effects data for a given quantity of each radionuclide (as provided by RADRISK). The DARTAB code calculated dose and risk for individuals at user-selected locations and for the population within an 80-km radius of the source. Radiation doses and risks could be broken down by radionuclide, exposure pathway, and organ.

Of the 11 conventional mills that were operating or in standby at that time, seven had unlined impoundments (the impoundments were clay lined, but not equipped with synthetic liners), while five had impoundments with synthetic liners. As the NESHAP revoked the exemption to the liner requirement of 40 CFR 192.32(a), the mills with unlined impoundments had to close the

[2] "Standby" means the period of time when a facility may not be accepting new tailings but has not yet entered closure operations.

impoundments and move towards final reclamation and long-term stabilization of the tailings impoundments.

2.3.1 Existing Impoundments

The NESHAP for operating uranium mill tailings addressed both existing and future tailings impoundments. For the existing impoundments, the radon emissions and estimated risks were developed using site-specific data for each of the 11 mills that were operating or in standby at the time the assessment was made. These data included the average Ra-226 content of the tailings, the overall dimensions and areas of the impoundments (developed from licensing data and aerial photographs), areas of dry (unsaturated) tailings, the existing populations within 5 km of the centers of the impoundments (identified by field enumeration), 5–80 km populations derived from U.S. Census tract data, meteorological data (joint frequency distributions) from nearby weather stations, mixing heights, and annual precipitation rates.

The AIRDOS-EPA code was used to estimate airborne concentrations based on the calculated Rn-222 source term for each facility. Rn-222 source terms were estimated on the assumption that an Rn-222 flux of 1 pCi/(m^2-sec) results for each 1 picocurie per gram (pCi/g) of Ra-226 in the tailings and the areas of dried tailings at each site. The radon flux rate of 1 pCi/(m^2-sec) per pCi/g Ra-226 was derived based on theoretical radon diffusion equations and on the lack of available radon emissions measurements.

For each sector in the 0–80 km grid around each facility, the estimated Rn-222 airborne concentration was converted to cumulative working level months (WLMs), assuming a 0.50 equilibrium fraction between radon and its decay products, an average respiration rate appropriate for members of the general public, and the assumption of continuous exposure over a 70-year lifetime. Using a risk coefficient of 760 fatalities/10^6 WLM, lifetime risk, fatal cancers per year, and the risk distribution were calculated for the exposed population.

The baseline risk assessment for existing uranium tailings showed an MIR of 3×10^{-5} which was below the benchmark level of approximately 1×10^{-4} and is, therefore, presumptively safe. Additionally, the risk assessment calculated 0.0043 annual fatal cancers in the 2 million persons living within 80 km of the mills. The distribution of the cancer risk showed that 240 persons were at risks between 1×10^{-5} and 1×10^{-4}, and 60,000 were at risks between 1×10^{-6} and 1×10^{-5}. The remainder of the population of about 2 million was at a risk of less than 1×10^{-6}. Based on these findings, EPA concluded that baseline risks were acceptable.

The decision on an ample margin of safety considered all of the risk data presented above plus costs, scientific uncertainty, and the technical feasibility of control technology necessary to lower emissions from operating uranium mill tailings piles. As the risks from existing emissions were very low, EPA determined that an emission standard of 20 pCi/(m^2-sec), which represented current emissions, was all that was necessary to provide an ample margin of safety. The necessity for the standard was explained by the need to ensure that mills continued the current control practice of keeping tailings wet and/or covered. Finally, to ensure that ground water was not adversely affected by continued operation of existing piles that were not synthetically lined

or clay lined, the NESHAP ended the exemption to the requirements of 40 CFR 192.32(a), which protects water supplies from contamination.

2.3.2 New Impoundments

The 1989 risk assessment for new mill tailings impoundments was based on a set of model mills, defined so that the impact of alternative disposal strategies could be evaluated. For the purpose of estimating the risks, the model mills were characterized to reflect operating mills, and the dispersion modeling and population exposures were based on the arid conditions and sparse population density that characterize existing impoundments in the southwestern states.

For new impoundments, a baseline consisting of one large impoundment (116 acres, which is 80% wet or ponded during its 15-year active life) was modeled (i.e., the continuation of the current practice). The baseline results indicated an MIR of 1.6×10^{-4}, a fatal cancer incidence of 0.014 per year, and only 20 persons at a risk greater than 1×10^{-4}. Given the numerous uncertainties in establishing the parameters for the risk assessment and in modeling actual emissions and exposures, the Administrator found that the baseline emissions for new tailings impoundments met the criteria for presumptively safe.

The decision on an ample margin of safety for new tailings considered two alternatives to the baseline of one large impoundment: phased disposal using a series of small impoundments and continuous disposal. The evaluation of these alternatives showed a modest reduction in the MIR and the number of fatal cancers per year, but a significant increase in the number of individuals at a lifetime risk of less than 1×10^{-6}. The costs estimated for the two alternatives showed that phased disposal would lead to an incremental cost of $6.3 million, while continuous disposal was believed to actually result in a modest cost saving of $1 million.

Given the large uncertainties associated with the risk and economic assessments performed for the new tailings impoundments, and considering the boom and bust cycles that the uranium industry has experienced, EPA determined that a work practice standard was necessary to prevent the risks from increasing if an impoundment were allowed to become dry. Finally, although continuous disposal showed slightly lower overall risks and costs than phased disposal, the Administrator recognized that it was not a proven technology for disposal of uranium mills tailings. Therefore, he determined that the work practice standard should allow for either phased disposal (limited to 40-acre impoundments, with a maximum of two impoundments open at any one time) or continuous disposal.

3.0 THE URANIUM EXTRACTION INDUSTRY TODAY: A SUMMARY OF THE EXISTING AND PLANNED URANIUM RECOVERY PROJECTS

Section 3.1 describes the historical uranium market in the United States. In the 1950s and 1960s, the market was dominated by the U.S. government’s need for uranium, after which the commercial nuclear power industry began to control the market. The next three sections describe the types of process facilities that were and continue to be used to recover uranium. Section 3.2 describes conventional mills and includes descriptions of several existing mines, while Section 3.3 describes ISL facilities. Heap leach facilities are described in Section 3.4. Finally,

Section 3.5 discusses the applicability of the Subpart W recommended radon flux monitoring method.

3.1 The Uranium Market

The uranium recovery industry in the United States is primarily located in the arid southwest. From 1960 to the mid 1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. The majority of the uranium production at that time was associated with defense needs, while a lesser amount was associated with commercial power reactor needs. Without exception, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. The conventional uranium mining/milling process is described in Section 3.2.

When the demand for uranium could not support the existing number of uranium recovery operations, there was a movement to decommission and reclaim much of the uranium recovery industry in the United States.

The UMTRCA Title I program established a joint federal/state-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet standards set by EPA.

The UMTRCA Title II program is directed toward uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the act provides –

- NRC authority to control radiological and nonradiological hazards.
- EPA authority to set generally applicable standards for both radiological and nonradiological hazards.
- Eventual state or federal ownership of the disposal sites, under general license from NRC.[3]

In the mid- to late 1980s, several commercial uranium recovery projects employing the solution, or ISL, mining process came on line. Section 3.3 describes the uranium ISL mining process. The uranium ISL projects and the data that they collected served as the industry standard. This industry saw an increase in activity as the conventional mine/milling operations were being shut down.

This shift in the method of uranium mining was associated with economic conditions that existed at the time. The price of uranium rapidly declined in the 1980s. The decline in price was associated with overproduction that took place during the earlier years. The peak in production was associated with Cold War production and associated contracts with DOE. However, as the

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[3] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/mill-tailings.html

Cold War came to an end, the need for uranium began to diminish. The amount of uranium that was needed for DOE projects was greatly diminished and, therefore, the price of uranium saw a decline. Figure 1 shows the spot prices for natural uranium. Note the price decline in the early 1980s.

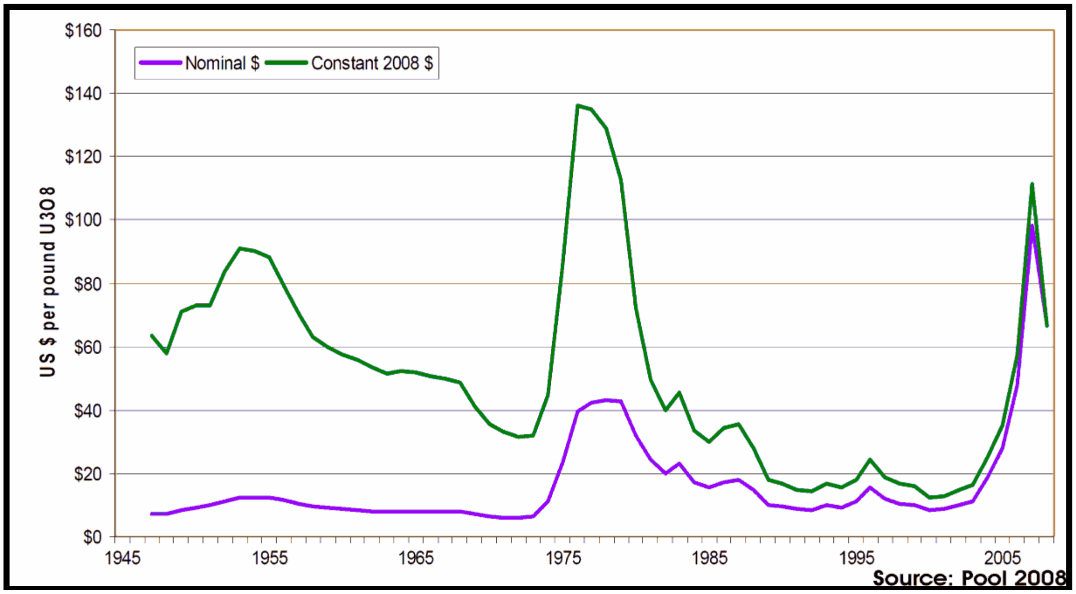
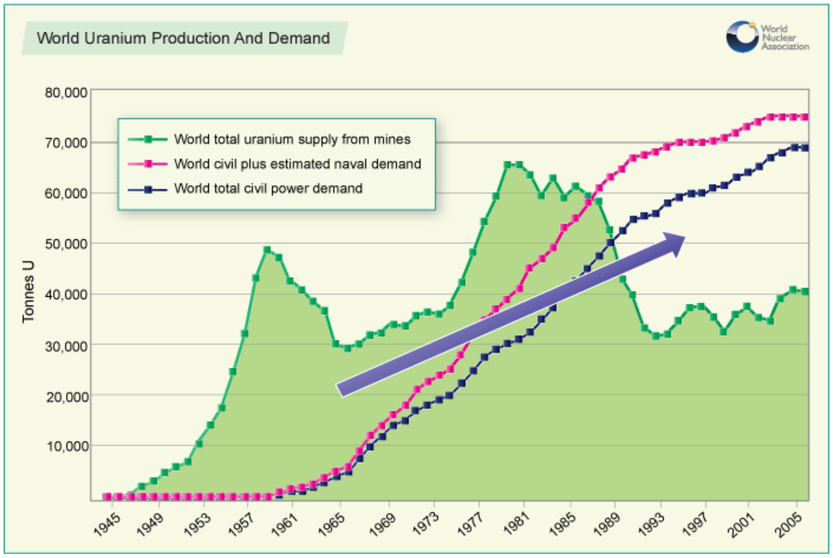


Figure 1: Historical Uranium Prices

Additionally, inexpensive uranium appeared on the worldwide market associated with the foreign supplies of low-grade and rather impure yellowcake. Only minimal purification and associated refinement was necessary to produce a yellowcake feedstock that could supply domestic and worldwide uranium needs from the low-grade foreign supply. Finally, the megatons to megawatts downblending program also supplied large supplies of uranium, both domestically and worldwide. Classical supply and demand economic principles established a market that had oversupply, constant demand and, therefore, a declining price. Consequently, the uranium industry in the United States saw a production decline. Although the number of uranium operations and production of domestic supply of uranium declined, several domestic uranium projects remained active, primarily supplying foreign uranium needs. These projects were generally located in the ISL mining production states of Nebraska, Texas, and Wyoming. This represented a significant shift in the method that was used to recover uranium, from conventional mines to ISL mines.

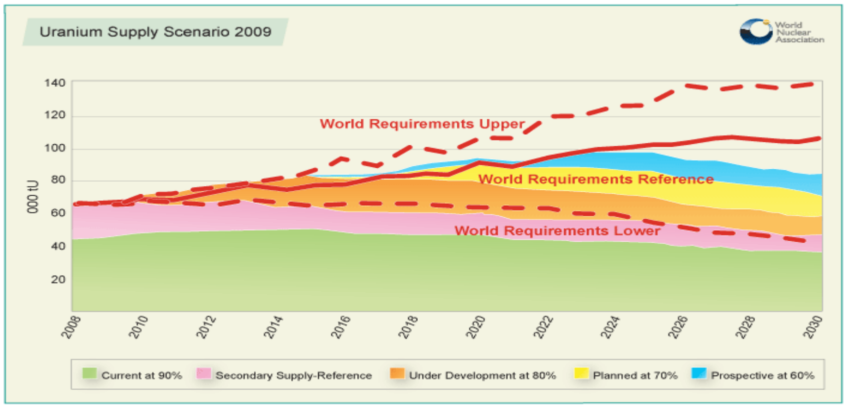
Numerous forecasts of worldwide uranium supply and demand exist. Perhaps one of the best graphical representations is from the World Nuclear Association. Figure 2 shows the actual uranium production rates from 1945 to 2005, as well as the demand trend that was established based on these production numbers. Figure 2 indicates that, from the 1960s to the present, the worldwide uranium demand has continued to increase even though the U.S. price for uranium has decreased.



Source: WNA 2010

Figure 2: Uranium Production and Demand from 1945 to 2005

Figure 3 shows the uranium supply scenario forecast by the World Nuclear Association. The three potential requirement curves shown are based on a variety of factors. The figure indicates that current production, as well as planned future worldwide production, may begin to fall short of demand in the next few years.



Source: WNA 2010

Figure 3: Uranium Supply Scenario from 2008 to 2030

In summary, all forecasts are for the uranium industry to show growth in the next decade and continuing for the foreseeable future. Drivers for this trend are a worldwide need for clean energy resources, the current trend to develop domestic sources of energy, and the investment of foreign capital in the United States, which is recognized as a politically and economically stable market in which to conduct business.

3.2 Conventional Uranium Mining and Milling Operations

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. There are currently no licensed heap leach facilities. Conventional uranium mining and milling operations are in the minority and are a carryover from the heavy production days of the 1970s and 1980s. Sweetwater Mill, Shootaring Canyon Mill, and White Mesa Mill represent the extent of the current conventional uranium milling operations that exist in the United States.

A conventional uranium mill is generally defined as a chemical plant that extracts uranium using the following process:

(1) Trucks deliver uranium ore to the mill, where it is crushed into smaller particles before the uranium is extracted (or leached). In most cases, sulfuric acid (H_2SO_4) is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. In addition to extracting 90–95% of the uranium from the ore, the leaching agent also extracts several other "heavy metal" constituents, including molybdenum, vanadium, selenium, iron, lead, and arsenic.

(2) The mill then concentrates the extracted uranium to produce a material called "yellowcake" because of its yellowish color.

(3) Finally, the yellowcake is transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 4 shows a schematic of a typical conventional uranium mill.

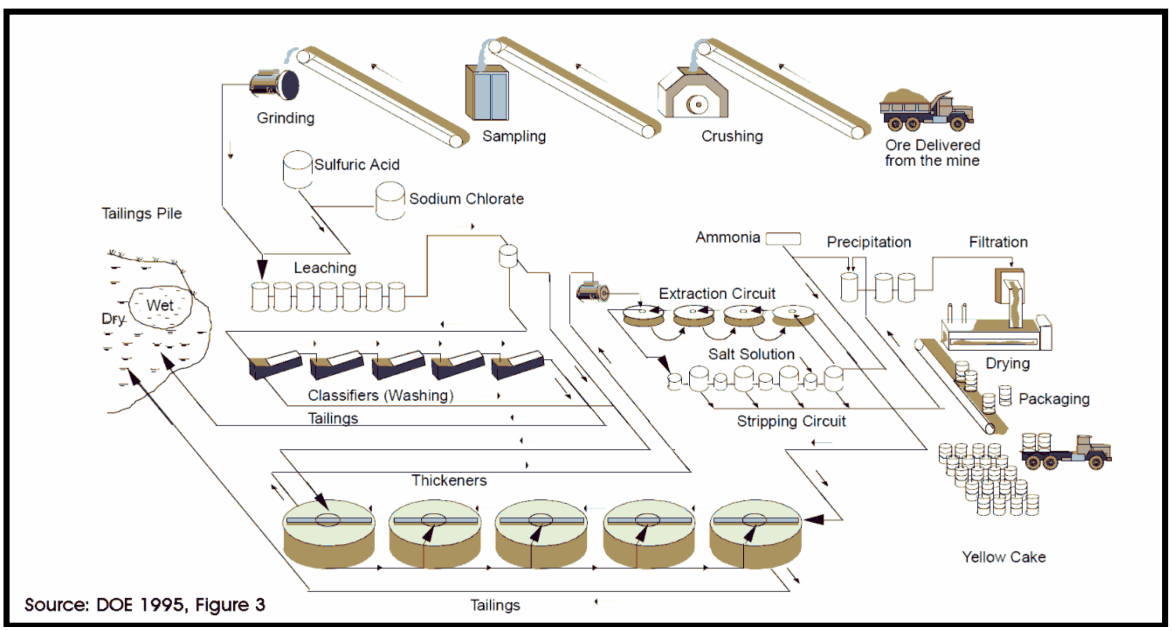


Figure 4: Typical Conventional Uranium Mill

Currently, there are three domestic licensed conventional uranium mining and milling facilities and a newly licensed facility that has yet to be constructed, as shown in Table 3.

Table 3: Conventional Uranium Mining and Milling Operations

Mill Name	Licensee	Location	Website
Sweetwater	Kennecott Uranium Co/Wyoming Coal Resource Co	Sweetwater County, Wyoming	None identified
Shootaring Canyon	Uranium One Americas	Garfield County, Utah	http://www.uranium1.com/ indexu.php?section=home
White Mesa	EFR White Mesa LLC	San Juan County, Utah	http://www.energyfuels.com/ white_mesa_mill/
Piñon Ridge	Energy Fuels Resources Corp.	Montrose County, Colorado	http://www.energyfuels.com/ projects/pinon-ridge/index.html
Mill Name	**Regulatory Status**		**Capacity (tons/day)**
Sweetwater	Standby,* license expires November 2014		3,000
Shootaring Canyon	Standby,* license expires May 2012		750
White Mesa	Operating, license expires March 2015		2,000
Piñon Ridge	Development, license issued January 2011		500 (design)

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

Instead of processing uranium ore, the conventional mills shown in Table 3 may process alternate feed stocks. These feed stocks are generally not typical ore, but rather materials that contain recoverable amounts of radionuclides, rare earths, and other strategic metals. These feed stocks are processed, the target materials are recovered, and the waste tailings are discharged to the tailings impoundment. The two facilities shown in Table 3 as being in standby (Sweetwater and Shootaring Canyon) have had their operating licenses converted into "possession only" licenses. Prior to recommencing operation, those facilities will be required to submit a license application to convert back to an operating license. EPA will review that portion of the license application associated with NESHAP to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures.

As described in Section 3.1, the rapid rise in energy costs, increased concerns about global warming, and the tremendous worldwide surge in energy use have all led to renewed interest in uranium as an energy resource. At the spring 2010 joint National Mining Association (NMA)/ NRC Uranium Recovery Workshop, the NRC identified numerous projects that have filed or are expected to file applications for new licenses, expansions of existing operations, or restarts of existing operations, including several proposals for conventional uranium recovery facilities. Contacts with the NRC and state regulatory agencies indicate that permitting and licensing actions are associated with the proposed conventional uranium milling and processing projects shown in Table 4. Although a significant uranium producer, at present, Texas has no interest in conventional uranium milling operations. The potential new mill at Piñon Ridge, Colorado, is not shown in Table 4, since its development is advanced and it has already been listed in Table 3.

Table 4: Proposed New Conventional Uranium Milling Facilities

Company	Site	(Estimated) Application Date	State
Uranium Energy Corp	Anderson Project	N.A.	AZ
Rio Grande Resources	Mt. Taylor	FY14	NM
Strathmore Minerals Corporation	Roca Honda	12-Sep	NM
Uranium Resources, Inc.	Juan Tafoya	FY 14	NM
Oregon Energy, LLC	Aurora Uranium Project	13-Dec	OR
Virginia Uranium	Coles Hills	N.A.	VA
Strathmore Minerals Corporation	Gas Hills	12-Sep	WY

N.A. = not available

No new construction has taken place on any milling facilities shown in Table 4; however, as with all industries, planning precedes construction. Considerable planning is underway for existing and new uranium recovery operations. As with facilities currently in standby, EPA will review the license application to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures for these proposed new mills.

No specific information is available on the type of tailings management systems intended for the proposed new conventional mills. To limit radon that could be emitted from the tailings impoundments, Subpart W requires that the tailings be disposed of in a phased disposal system with disposal cells not larger than 40 acres, or by continuous disposal in which not more than 10 acres of exposed tailings may accumulate at any time. Regardless of the type of tailings management system the new milling operations select, they will all also have to demonstrate that their proposed tailings impoundment systems meet the requirements in 40 CFR 192.32(a)(1).

3.2.1 Sweetwater Mill, Kennecott Mining Company, Red Desert, Wyoming

The Sweetwater project is a conventional uranium recovery facility located about 42 mi northwest of Rawlins, Wyoming, in Sweetwater County. The site is very remote and located in the middle of the Red Desert. The approximately 1,432-acre site includes an ore pad, overburden pile, and the milling area (see Figure 5). The milling area consists of administrative buildings, the uranium mill building, a solvent extraction facility, and a maintenance shop. There is also a 60-acre tailings management area with a 37-acre tailings impoundment that contains approximately 2.5 million tons of tailings material. The Sweetwater impoundments are synthetically lined, as required in 40 CFR 192.32(a). The facility is in a standby status and has a possession only license administered by the NRC. The future plans associated with this facility are unknown, but the facility has been well maintained and is capable of processing uranium. The standby license for this facility is scheduled to expire in 2014. The licensee and/or regulator will decide whether to renew or to terminate this license.

Figure 5: Sweetwater – Aerial View

To demonstrate compliance with Subpart W, testing on the facility's tailings impoundment for radon emissions is conducted annually (KUC 2011). Table 5 shows the results of that testing. The lower flux readings measured in 2009 and 2010 are a direct result of the remediation work (regrading and lagoon construction in the tailings impoundment) performed in 2007 and 2008.

Table 5: Sweetwater Mill Radon Flux Testing Results

Test Date	Radon Flux (pCi/(m^2-sec))	Test Date	Radon Flux (pCi/(m^2-sec))
August 7, 1990	9.0	August 14, 2001	6.98
August 13, 1999	5.1	August 13, 2002	4.10
August 5, 1992	5.6	August 12, 2003	7.11
August 24, 1993	5.0	August 17, 2004	6.38
August 23, 1994	5.0	August 16, 2005	7.63
August 15, 1995	3.59	August 15, 2006	3.37
August 13, 1996	5.47	August 13, 2007	6.01
August 26, 1997	4.23	August 5, 2008	4.59
August 11, 1998	2.66	July 30, 2009	1.60
August 10, 1999	1.27	August 10, 2010	1.44
August 8, 2000	4.05		

Source: KUC 2011, p. 6

Summary of Results

Air monitoring data were reviewed for a 26-year period (1981 to 2007). Upwind Rn-222 measurements, as well as downwind Rn-222 values, were available. The average upwind radon value for the period of record was 3.14 picocuries per liter (pCi/L). The average downwind radon value for the same period was 2.60 pCi/L. These values indicate that there is no measurable contribution to the radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility.

Approximately 28.3 acres of tailings are dry with an earthen cover; the remainder of the tailings is continuously covered with water. The earthen cover is maintained as needed. One hundred radon flux measurements were taken on the exposed tailings, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed beaches was 8.5 pCi/(m^2-sec). The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/(m^2-sec). The calculated radon flux from the entire tailings impoundment surface is approximately 30% of the 20.0 pCi/(m^2-sec) standard.

3.2.2 White Mesa Mill, Energy Fuels Corporation, Blanding, Utah

The White Mesa project is a conventional uranium recovery facility located about 6 mi south of Blanding, Utah, in San Juan County. The approximately 5,415-acre site includes an ore pad, overburden pile, and the milling area (see Figure 6). The mill area occupies approximately 50 acres and consists of administrative buildings, the uranium milling building, and ancillary facilities. The facility used a phased disposal impoundment system, and two of the 40-acre cells are open. The facility has operated intermittently in the past, and this type of operation continues on a limited basis. The amount of milling that takes place, as well as the amount of uranium that is being produced, is a small fraction of the milling capacity. The uranium recovery project has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control.

Figure 6: White Mesa – Aerial View

To demonstrate compliance with Subpart W, the radon flux from tailings surfaces is measured and reported to the State of Utah annually. As Table 6 shows, these data consistently demonstrate that the radon flux from the White Mesa Mill's tailings cells are below the criteria.

Table 6: White Mesa Mill's Annual Radon Flux Testing, Tailings Cells 2 & 3

Year	Radon Flux (pCi/(m^2-sec))	
	Cell 2	**Cell 3**
1997	12.1	16.8
1998	14.3	14.9
1999	13.3	12.2
2000	9.3	10.1
2001	19.4	10.7
2002	19.3	16.3
2003	14.9	13.6
2004	13.9	10.8
2005	7.1	6.2

Source: Denison 2007, p. 116

The Table 6 radon flux values for 2001 and 2002 were elevated when compared to the prior years. Denison believes that these radon fluxes were largely due to the drought conditions in those years, which reduced the moisture content in the interim cover placed over the inactive portions of tailings Cells 2 and 3. In addition, the beginning of the 2002 mill run, which resulted in increased activities on the tailings cells, may have contributed to these higher values. As a result of the higher radon fluxes during 2001 and 2002, additional interim cover was placed on

the inactive portions of Cells 2 and 3. While this effort was successful, additional cover was applied again in 2005 to further reduce the radon flux (Denison 2007).

Summary of Results

Air monitoring data were reviewed for a 2-year period (2006 to 2008). The White Mesa site utilized the MILDOS code to calculate radon concentrations (ANL 1998), in the same calculation process that had been used since 1995. As a comparison, Denison Mines reactivated the six air monitoring stations that were used at the site. Data from these stations were collected for a 2-year period. The upwind and downwind measurements showed no definable trends. At times, the upwind concentrations were the higher values, while at other times, the downwind concentrations were the greatest. However, all values were within regulatory standards.

The tailings facilities at the White Mesa facility consist of the following impoundments/cells (Denison 2011):

- Cell 1, constructed with a 30-millimeter (mil) PVC earthen-covered liner, is used for the evaporation of process solution (Cell 1 was previously referred to as Cell 1-I, but is now referred to as Cell 1).

- Cell 2, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands. Cell 2 has 67 acres of surface area. Because 99% of the cell has a soil cover over the deposited tailings, only 0.7 acres of tailings are exposed as tailings beaches.

- Cell 3, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands and solutions. Cell 3 has 71 acres of surface area, and 54% of the cell has a soil cover over the deposited tailings. The remainder of the cell consists of tailings beaches (19%) and standing liquid (26%).

- Cell 4A, constructed with a geosynthetic clay liner, a 60-mil high-density polyethylene (HDPE) liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in October 2008.

- Cell 4B, constructed with a geosynthetic clay liner, a 60-mil HDPE liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in February 2011.

One hundred radon flux measurements were collected on the Cell 2 beach area, and an additional 100 measurements were taken on the soil-covered area in accordance with Method 115 for Subpart W analysis. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The average radon flux for all of Cell 2 was calculated to be 13.5 pCi/(m^2-sec), or about 68% of the 20.0 pCi/(m^2-sec) standard.

At Cell 3, 100 radon flux measurements were collected from each of the soil cover and the beach areas, as required by Method 115. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The radon flux from the standing liquid-covered area was assumed to be zero. The average radon flux for all of Cell 3 was calculated to be 8.9 pCi/(m^2-sec), or about 46% of the 20.0 pCi/(m^2-sec) standard.

3.2.3 Shootaring Canyon Mill, Uranium One Incorporated, Garfield County, Utah

The Shootaring Canyon project is a conventional uranium recovery facility located about 3 mi north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings management system that is partially constructed (see Figure 7). The mill circuit operated for a very short time and generated only enough tailings to cover 7 acres of the impoundment. Although the milling circuit has been dismantled and sold, the facility is in a standby status and has a possession only license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company. The standby license for this facility is scheduled to expire in 2014. The licensee and/or the regulator will decide whether to renew or to terminate this license.

Figure 7: Shootaring Canyon – Aerial View

Summary of Results

Air monitoring data were reviewed for a 2-year period (2009 to 2010). Continuous air monitoring is not conducted at the site; rather, a 20- to 24-hour sampling event is required once per quarter as a condition of the license. The high-volume air sampler is located downwind of the tailings facility. Many sampling events during a 2-year period indicate that the downwind

Rn-222 concentrations are around 1% of the allowable effluent concentration limit. The two years of data reviewed indicated no trends.

The Shootaring Canyon facility operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in an area of 2,508 m^2 (0.62 acres). The tailings are dry except for moisture-associated occasional precipitation events; consequently, there are no beaches. The tailings have a soil cover that is maintained by the operating company. The impoundment at Shootaring Canyon is synthetically lined, as required in 40 CFR 192.32(a).

One hundred radon flux measurements were collected on the soil-covered tailings area in accordance with Method 115. The 2009 sampling results indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), which exceeded the allowable 20 pCi/(m^2-sec) regulatory limit. In response to this result, the licensee notified the Utah Division of Radiation Control and placed additional soil cover on the tailings. The soil cover consisted of local borrow materials in the amount of 650 cubic yards. More sampling took place during the week of November 7, 2009. An additional 100 sample results were collected and showed that the average radon flux was reduced to 18.1 pCi/(m^2-sec). Sampling for 2010 took place in April. Again, 100 radon flux measurements were collected. The average radon flux revealed by this sampling was 11.9 pCi/(m^2-sec).

3.2.4 Piñon Ridge Mill, Bedrock, Colorado

The Piñon Ridge project is a permitted conventional uranium recovery facility in development. The permitted location is located about 7 mi east of Bedrock, Colorado, and 12 mi west of Naturita, Colorado, in Montrose County (see Figure 8). The approximately 1,000-acre site will include an administration building, a 17-acre mill site, a tailings management area with impoundments totaling approximately 90 acres, a 40-acre evaporation pond with proposed expansion of an additional 40-acre evaporation pond as needed, a 6-acre ore storage area, and numerous access roads. The design of the tailings management area is such that it can meet the work practice standard with a synthetically lined impoundment, a leak detection system, and a surface area that does not exceed 40 acres. The facility has not been constructed, but is fully licensed and administered by the Colorado Department of Public Health and Environment. Also, EPA has approved the facility's license to construct under NESHAP Subpart A of 40 CFR 61. Current activities at the site are maintenance of pre-operational environmental monitoring.

Figure 8: Piñon Ridge – Aerial View

3.2.5 Conventional Mill Tailings Impoundments and Radon Flux Values

In summary, the radon data for the active mill tailings impoundments indicate that the radon exhalation rates from the measured surfaces have exceeded the regulatory standard of 20 pCi/(m^2-sec) at times. Two instances exist in the records that were reviewed. One instance was in 2007, when a portion of the Cotter Corporation impoundment did not have sufficient soil cover. Monitoring results showed a flux rate of 23.4 pCi/(m^2-sec). The tailings surface was covered with a soil mixture, and the flux rate was reduced to 14.0 pCi/(m^2-sec). The second instance in which the regulatory standard was exceeded was recorded during the 2009 sampling event at Shootaring Canyon Mill. This sampling event indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), caused by insufficient soil cover. Although covering tailings piles with various other materials (e.g., synthetics, asphalt, soil-cement mixtures) has been studied, covers made of earth or soil have been shown to be the most cost effective in reducing radon emissions (EPA 1989, NRC 2010). In both cases when monitoring indicated radon fluxes in excess of the standard, additional soil cover was added to the tailings, and the radon flux rates were reduced to below the regulatory standards.

Table 8 shows the average/calculated radon flux values, as reported by the uranium recovery operators.

Table 7: Mill Tailings Impoundments and Average/Calculated Radon Flux Values*

Facility	Radon Flux (pCi/(m²-sec))		Calculated Tailings Impoundment Average Radon Flux (pCi/(m²-sec))
	Soil-Covered Area	Tailings Beach	
Sweetwater Mill	No soil-covered area	8.5	6.01
White Mesa Mill, Cell 2	13.1	50.2	13.5
White Mesa Mill, Cell 3	13.9	6.7	8.9
Shootaring Canyon Mill	15 2-year average	Not applicable	15 2-year average
Piñon Ridge Mill	Not applicable	Not applicable	Not applicable

* The respective uranium recovery operators supplied all data and calculations.

3.3 In-Situ Leach Uranium Recovery (Solution Mining)

Solution, ISL or in-situ recovery (ISR), mining is defined as the leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface (IAEA 2005). Leaching, or more correctly the remobilization of uranium into solution, is accomplished through the injection into the ore body of a lixiviant. The injection of a lixiviant essentially reverses the geochemical reactions associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects of the 1980s demonstrated solution mining as a viable uranium recovery technique. Initial efforts at the solution mining process were often less than ideal:

- Lixiviant injection was difficult to control, primarily because of poor well installation.
- Laboratory-scale calculations did not always perform as suspected in geological formations.
- Recovery well spacing was poorly understood, causing mobilized solutions to migrate in unsuspected pathways.
- Restoration efforts were not always effective in re-establishing reducing conditions; therefore, some metals remained in solution and pre-mining ground water conditions were not always achievable.

Additional research and development work indicated that mining solutions could be controlled with careful well installation. The use of reducing agents during restoration greatly decreased the amount of metals that were in solution. As a result of these modifications in mining methods, solution mining of uranium became a viable method to recover some uranium deposits, many of which could not be economically mined by the open pit methods typically employed by the uranium industry. Additionally, the economics of solution mining were more favorable than conventional mining and milling. Because of these factors, solution mining and associated processing began to dominate the uranium recovery industry. Figure 10 shows a schematic of a typical ISL uranium recovery facility.

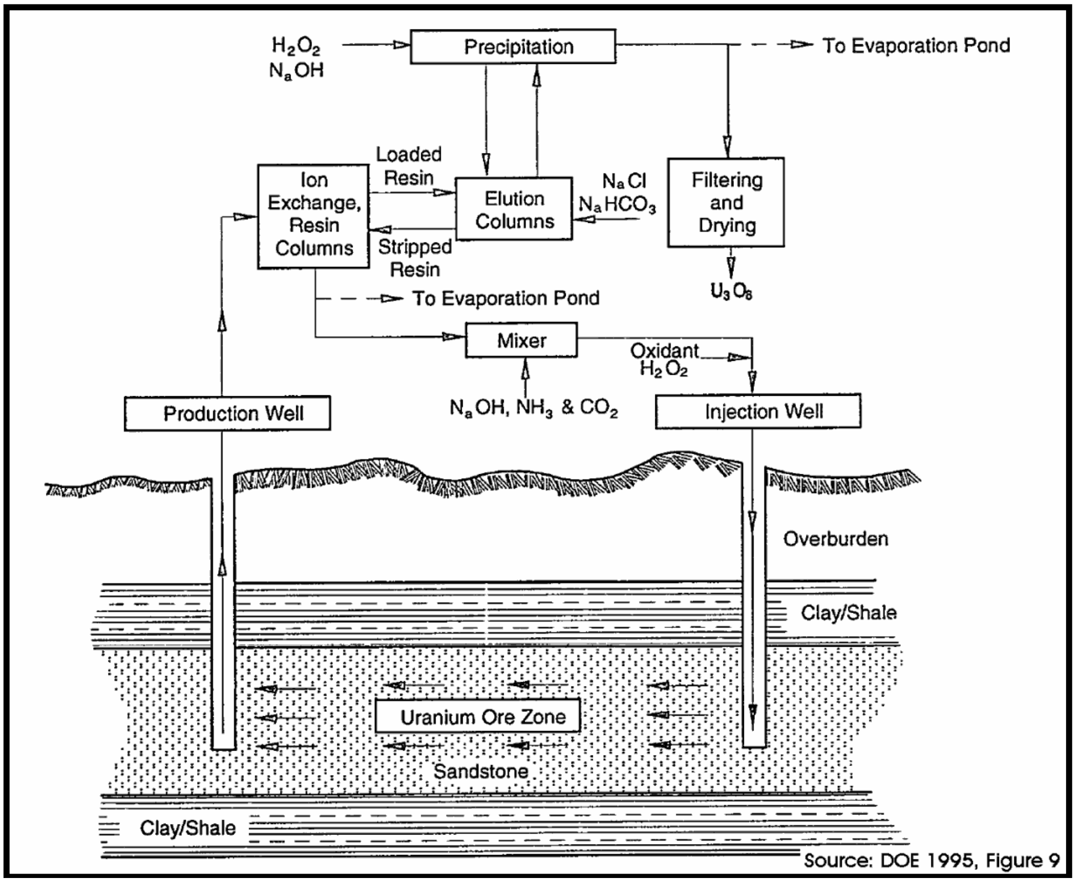


Figure 9: In-Situ Leach Uranium Recovery Flow Diagram

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. As Figure 10 shows, the liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. The pond/impoundment may be used to dispose of the liquid via evaporation, or it may be used simply to hold the liquid until a sufficient amount has been accumulated so that other means may be used to dispose of it (e.g., land application or irrigation, deep well disposal). Since Ra-226 is present in the water bled from the lixiviant, radon will be generated in and released from the solution mining facility's evaporation/holding ponds or impoundments.

The 1989 NESHAP risk assessment (EPA 1989), although not conducted specifically for solution mining sites, is applicable to ponds/impoundments at solution mining facilities. All of the ponds at solution mining facilities are synthetically lined. Because of the presence of liners, none would be required to be closed. The solution mining industry is more transient in that the impoundment life is less than those at conventional uranium mining and milling sites. Typically, the impoundments are in the range of 1–4 acres and are built to state-of-the-art standards.

Two types of lixiviant solutions, loosely defined as acid or alkaline systems, can be used. In the United States, the geology and geochemistry of most uranium ore bodies favor the use of "alkaline" lixiviants or bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of

the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground water restoration. The acid systems once used in the United States are still used in Eastern Europe and Asia and were used recently in Australia on ore bodies in saline aquifers (IAEA 2005).

The four major types of uranium deposits in the United States are: strata-bound (roll front), solution breccia pipe, vein, and phosphatic deposits (EPA 1995). Of these, ISL is the uranium recovery technique used mostly on strata-bound ore deposits. Strata-bound ore deposits are ore deposits contained within a single layer of sedimentary rock. They account for more than 90% of the recoverable uranium and vanadium in the United States and are found in three major geographic areas: the Wyoming Basin (Wyoming and Nebraska), Colorado Plateau or Four Corners area (northwestern New Mexico, western Colorado, eastern Utah, and northeastern Arizona), and southern Texas. A discussion of the origin of the uranium ore, including ore body formation and geochemistry, may be found in the reference, *Technical Resource Document Extraction and Beneficiation of Ores and Minerals*, Volume 5, “Uranium” (EPA 1995). Much of the recoverable uranium in these regions lends itself to ISL because of the physical and geochemical properties of the ore bodies.

Four times a year, the Energy Information Administration (EIA) publishes data on the status of U.S. ISL facilities. EIA (2013) identified six ISL facilities that were recovering uranium and producing yellowcake in the 2nd quarter of 2013. Table 8 shows these facilities. These operations are located in NRC-regulated areas, as well as in Agreement States.

Table 8: Operating ISL Facilities

Plant Owner	Plant Name	County, State
Cameco	Crow Butte Operation	Dawes, Nebraska
Power Resources, Inc. dba Cameco Resources	Smith Ranch-Highland Operation	Converse, Wyoming
Uranium Energy Corp. dba South Texas Mining Venture	Hobson ISR Plant	Karnes, Texas
	La Palangana	Duval, Texas
Mestena Uranium LLC	Alta Mesa Project	Brooks, Texas
Uranium One USA, Inc.	Willow Creek Project (Christensen Ranch and Irigaray)	Campbell and Johnson, Wyoming

The two major geographical areas of ISL mining and processing have been Texas and Wyoming. These areas are well suited to this ISL mining technology, in that the geology associated with the mineralized zone is contained by layers of impervious strata. Texas is the major producer of uranium from ISL operations, followed by Wyoming. ISL operations in South Dakota and Nebraska recover lesser amounts of uranium.

For the 2nd quarter of 2013, EIA (2013) identified the ISL facilities shown in Table 9 as being developed, or partially or fully permitted and licensed, or under construction. As discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining actions.

As the data in Table 9 show, there is considerable interest in ISL mining operations in the U.S. uranium belt. Many of the existing ISL operations are planning for expansion by preparing the license applications and other permitting documents. It is apparent that most domestic uranium recovery will be associated with existing and new ISL operations.

Table 9: ISL Facilities That Are Restarting, Expanding, or Planning for New Operations

Plant Owner	**Plant Name**	**County, State (existing and *planned* locations)**	**Status, 2nd Quarter 2013**
Powertech Uranium Corp	Dewey Burdock Project	*Fall River and Custer, South Dakota*	Developing
Uranium One Americas, Inc.	Jab and Antelope	*Sweetwater, Wyoming*	Developing
Hydro Resources, Inc.	Church Rock	*McKinley, New Mexico*	Partially Permitted And Licensed
Hydro Resources, Inc.	Crownpoint	*McKinley, New Mexico*	Partially Permitted And Licensed
Strata Energy Inc	Ross	*Crook, Wyoming*	Partially Permitted And Licensed
Uranium Energy Corp.	Goliad ISR Uranium Project	*Goliad, Texas*	Permitted And Licensed
Uranium One Americas, Inc.	Moore Ranch	*Campbell, Wyoming*	Permitted And Licensed
Lost Creek ISR, LLC	Lost Creek Project	Sweetwater, Wyoming	Under Construction
Uranerz Energy Corporation	Nichols Ranch ISR Project	Johnson and Campbell, Wyoming	Under Construction

Table 10 shows the size of the surface impoundments at ISL facilities. It is noteworthy that the operation of these facilities does not require impoundments nearly as large as the impoundments used at conventional mills. The impoundments are utilized for the evaporative management of waste water. The impoundments are small because a minimal percentage of the process water needs to be over-recovered to maintain solution flow to the recovery wells. The solution mining industry has used deep well injection for most of the waste water. All signs indicate that this type of waste water disposal will continue in the future.

Table 10 shows that all of the solution mining sites reviewed are using the deep well injection method.

Table 10: ISL Evaporation Pond Data Compilation

Operation	Evaporation pond?	Date pond was constructed	Size of pond	Synthetic liner under pond?	Leak detection system?	Deep well injection?
Cameco, Smith Ranch	East and west ponds	1986	8.6 acres	Yes	Yes, ponds have had leaks	Yes, used for most waste water, started in 1999
Cameco, Crow Butte	3 commercial ponds and 2 R&D ponds	R&D ponds 1990	Pond 1, 2, 5 850×200 ft Pond 3, 4 700×250 ft	Yes	Yes	Yes, all bleed stream
Hydro Resources, Crown Point	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Hydro Resources, Church Rock	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Uranium Resources Inc., Kingsville Dome	Two 120×120 ft ponds	1990	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Vasquez	Two 150×150 ft ponds	1990	150×150 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Rosita	Two 120×120 ft ponds	1985	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Mestena, Alta Mesa	Evaporation data not found					
STMV, La Palangana	Evaporation data not found					

3.3.1 Radon Emission from Evaporation and/or Holding Ponds

Unlike conventional mills, ISL facilities do not produce tailings or other solid waste products. However, they do generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, an extraction solution (lixiviant), composed of ground water enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes the uranium. The resulting "pregnant" lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field. This is accomplished by bleeding off a portion of the process flow. Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant washdown. One method to dispose of these liquid wastes is to evaporate them from ponds. Deep well injection and land application (i.e., irrigation) are other methods for disposing of the liquid wastes. For these disposal methods, the waste liquid is collected in holding ponds until a quantity sufficient for disposal has been accumulated.

As defined by the AEA of 1954, as amended, byproduct material includes tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content (42 USC 2014(e)(2)). Clearly, waste water generated during solution mining is within this definition of byproduct material and is thus subject to the requirements of Subpart W.

The waste water contains significant amounts of radium, which will radiologically decay and generate radon gas. Radon diffuses much more slowly in water than it does in air. For example, the radon diffusion coefficient in water is about 10,000 times smaller than the coefficient in air (i.e., on the order of 10^{-5} square centimeters per second (cm^2/sec) for water and 10^{-1} cm^2/sec for air (Drago 1998, as reported in Brown 2010)). Thus, if the tailings piles are covered with water, then most of the radon would decay before it could diffuse its way through the water. However, since over time periods comparable to the half-life of radon, there is considerable water movement within a pond, advective as well as diffusive transport of radon from the pond water to the atmosphere must be considered. The water movement is partly caused by surface wind currents, thermal gradients, mechanical disturbance from the mill discharge pipe, and biological disturbances (animals, birds, etc.). Dye movement tests indicate that for shallow (less than 1 meter) pond water, advective velocities may exceed 1–2 millimeters per minute, resulting in virtually no radon containment by the surface water. If shallow water movement is sufficient to remove radon from the tailings-water interface and transport it to the atmosphere in a short time (several hours), the radon flux from the shallow tailings is nearly as great as that from similar bare saturated tailings; hence, no significant radon attenuation is gained by covering the tailings with water (Nielson and Rogers 1986). Consequently, in order for a pond covering a tailings pile to be effective at reducing the release of radon, the pond water must be greater than 1 meter in depth.

Additionally, if there is radium in the pond water, radon produced from that radium could escape into the atmosphere. A review of the various models used for estimating radon flux from the

surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model (Schwarzenbach et al. 2003)), coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond's water and the assumption that radon is in secular equilibrium with the radium. The radon flux from the surface of an evaporation pond, as a function of the wind speed (for winds less than 24 miles per hour (mph)), can be estimated using this model with the following equation:

$$J = \frac{1.48\times10^{-4}}{e^{-0.351V}} C_w \qquad (3\text{-}1)$$

Where	J	=	Radon flux	(pCi/(m^2-sec))
	C_w	=	Concentration of radium in the water	(pCi/L)
	V	=	Wind speed	(m/sec)

Implicit in this model is the fact that in pond water the radon diffusion coefficient is 10^{-5} cm^2/sec and that the thickness of the stagnant film layer can be estimated by an exponential relationship with wind speed (Schwarzenbach et al. 2003).

Baker and Cox (2010) measured the radium concentration in an evaporation pond at the Homestake Uranium Mill Site at 165 pCi/L. Assuming a direct conversion to Rn-222 (165 pCi/L), the flux is estimated from equation 3-1 at 1.65 pCi/(m^2-sec). This is comparable to measurements of the flux, which averaged 1.13 pCi/(m^2-sec). However, the Homestake measurement method did not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data were found for measurements of the radon flux on evaporation ponds versus wind speed.

The model should not be used for wind speeds above 10 meters per second (m/sec) (24 mph). However, this is not expected to be a major limitation for estimating normal radon releases and impacts from operational evaporation ponds.

Using actual radium pond concentrations and wind speed data in equation 3-1, the radon pond flux was calculated from several existing ISL sites (SC&A 2010). Results showed that the radon flux ranged from 0.07 to 13.8 pCi/(m^2-sec). This indicates that the radon flux above some evaporation ponds can be significant (e.g., can exceed 20 pCi/(m^2-sec)). If such levels occur, there are methods for reducing the radium concentration in the ponds, the most straightforward being dilution. However, this solution is temporary, as evaporation will eventually increase the concentration. A second method is to use barium chloride ($BaCl_2$) to co-precipitate the radium to the bottom of the pond. The radon generated at the depths of the bottom sediments will decay before reaching the pond surface.

Again using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from three sites. The evaporation pond contribution to the site's total radon release was small (i.e., less than 1%).

Two additional sources of radon release were investigated: the discharge pipe and evaporation sprays. The discharge pipe is used to discharge bleed lixiviant to the evaporation pond. Radon

releases occur when the bleed lixiviant exits the pipe and enters the pond. The investigation found that these radon releases are normally calculated using the methodology in NUREG-1569, Appendix D (NRC 2003); thus, this source is currently included in the total radon releases reported for an ISL site. For a "typical" ISL, with a purge water radon concentration of 3.2×10^5 pCi/L and a purge rate of 5.5×10^5 liters per day (L/d) or about 100 gallons per minute (gpm), NUREG-1569, Appendix D, calculated the radon released from the discharge pipe to be 64 Ci/yr.

Spray systems are sometimes used to enhance evaporation from the ponds. A model to calculate radon releases during spray operation was developed (SC&A 2010). Also, data from ISL ponds were used to estimate this source of radon release. The radon releases from spray operations were reported to range from <0.01 to <3 pCi/(m^2-sec) (SC&A 2010). Furthermore, operation of the sprays would reduce the radon concentration within the pond; therefore, the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium). Hence, operation of spray systems to enhance evaporation is not expected to significantly increase the amount of radon released from the pond.

3.4 Heap Leaching

Heap leaching is a process by which chemicals are used to extract the uranium from the ore. A large area of land is leveled with a small gradient, layering it with HDPE or linear low-density polyethylene (LLDPE), sometimes with clay, silt or sand beneath the plastic liner. Ore is extracted from a nearby surface or an underground mine. The extracted ore will typically be run through a crusher and placed in heaps atop the plastic. A leaching agent (often H_2SO_4) will then be sprayed on the ore for 30–90 days. As the leaching agent percolates through the heap the uranium will break its bonds with the oxide rock and enter the solution. The solution will then flow along the gradient into collecting pools from which it will be pumped to an onsite processing plant.

In the past, there have been a few commercial heap leach facilities, but currently none are operating. However, this type of facility can be rapidly constructed and put into operation. Planning and engineering have begun for two heap leach facilities. At the spring 2010 joint NMA/NRC Uranium Recovery Workshop, the NRC identified two proposed heap leach projects, one in Wyoming and the other in New Mexico, as shown in Table 11. In addition to these two projects, Cotter has indicated to the Colorado Department of Public Health and Environment that it intends to retain the use of the secondary impoundment at its Cañon City site for heap leaching in the future (Hamrick 2011).

Table 11: Anticipated New Heap Leach Facilities

Owner	Site	State
Energy Fuels[4]	Sheep Mountain	Wyoming
Uranium Energy Corporation	Grants Ridge	New Mexico

Source: NMA 2010

[4] Energy Fuels acquired the Sheep Mountain Project through its acquisition of Titan Uranium Inc. in February 2012 (http://www.energyfuels.com/development_projects/sheep_mountain/, accessed 9/25/2013).

Higher uranium prices will likely lead to the processing of low-grade ore currently found in the uranium districts in Wyoming and New Mexico. Much of the low-grade ore currently exists in spoil piles that were not economical to truck to milling operations. Little processing equipment is necessary to bring heap leach operations on line. Additionally, minimal personnel are necessary to operate and monitor such an operation. However, the application of NESHAP Subpart W to heap leach facilities should be clarified (see Section 5.0). At a minimum, it is expected that these types of facilities will be limited in acreage according to the Subpart W standard and will be required to have synthetic liners with monitored leak detection systems.

Attempts have been made at heap-leaching low-grade uranium ore, generally by the following process:

(1) Small pieces of uncrushed ore are placed in a pile, or "heap", on an impervious pad of plastic, clay, or asphalt, to prevent uranium and other chemicals from migrating into the subsurface.

(2) An acidic solution is then sprayed onto the heap, which dissolves the uranium as it migrates through the ore.

(3) Perforated pipes under the heap collect the uranium-rich solution, and drain it to collection basins, from where it is piped to the processing plant.

(4) At the processing plant, uranium is concentrated, extracted, stripped, and dried to produce a material called "yellowcake."

(5) Finally, the yellowcake is packed in 55-gallon drums to be transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 10 shows a schematic of a typical heap-leaching uranium recovery facility.

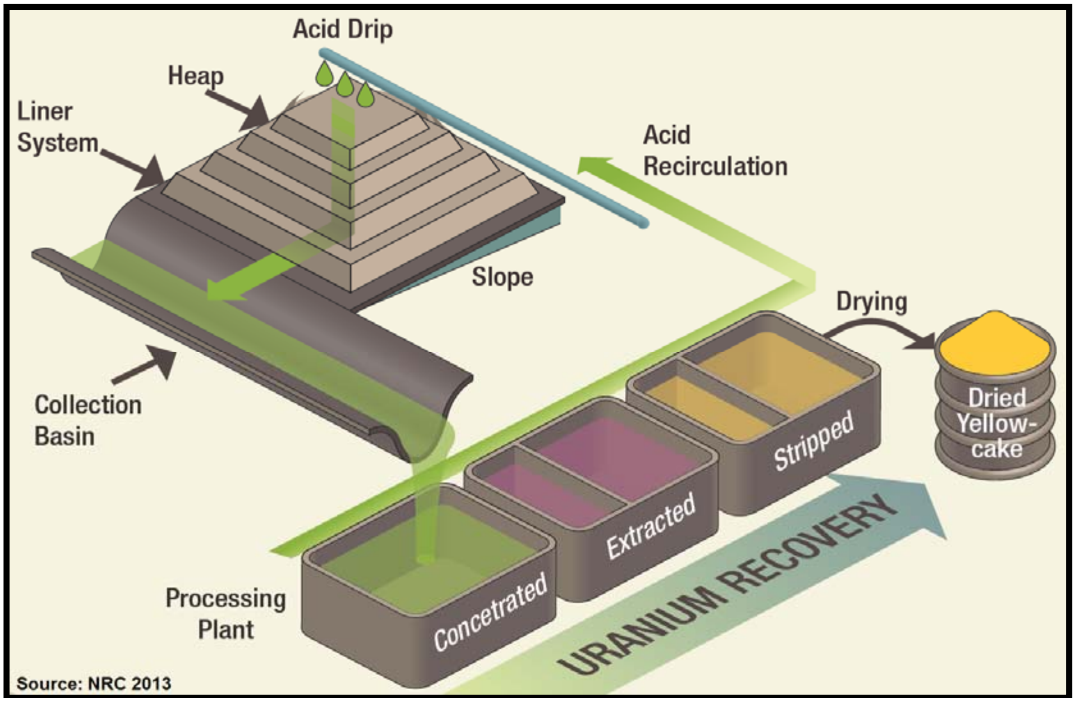


Figure 10: Typical Heap-Leaching Uranium Recovery Facility

Heap-leaching was not an industry trend; rather, it was an attempt to process overburden that contained a minimal concentration of uranium. Production records associated with this processing technique were not maintained, but certainly the technique represented less than 1% of the recovered uranium resources. Almost all of the conventional uranium recovery operations were stand-alone facilities that included the mining, milling, processing, drying, and containerization of the yellowcake product. The yellowcake product was then trucked to processing facilities that refined the raw materials into the desired product.

3.4.1 Sheep Mountain Mine, Energy Fuels, Fremont County, Wyoming

The Sheep Mountain mine, located at approximate 42º 24' North and 107º 49' West, has operated as a conventional underground mine on three separate occasions. Mining on the Sheep Mountain property started in 1956 and continued in several open pit and underground operations until 1982. The Sheep I shaft was sunk in 1974, followed by the Sheep II shaft in 1976. Production from the Sheep I shaft in 1982 was reported to be 312,701 tons at an average grade of 0.107% U_3O_8 (triuranium octoxide). In 1987, an additional 12,959 tons at 0.154% U_3O_8 were produced, followed by 23,000 tons at 0.216% U_3O_8 in 1988. The Sheep II shaft has had no production. The Congo Pit is essentially a single open pit which was being readied for development in the early 1980s, but plans were never realized because of the collapse of the uranium market. Feed from Sheep Mountain was processed at the Split Rock Mill, which was located north of Jeffrey City. Figure 11 shows the Sheep Mountain mine.

Figure 11: Sheep Mountain – Aerial View

Energy Fuels plans to develop the Sheep Mountain mine with both conventional underground and open pit mining, followed by heap leach extraction of the uranium with an ion-exchange recovery plant producing up to 1.5 million pounds of U_3O_8 per year. Energy Fuels' plans include the development of both the Sheep I and Sheep II underground mines, with access from twin declines. At its peak production, the underground mine will produce approximately 1.0 million pounds U_3O_8 per year. The Congo Pit will also be developed, producing an average of 500,000 pounds U_3O_8 per year. Recovery of the uranium will include heap leach pads using H_2SO_4 and a conventional recovery plant, through to yellowcake production on site. Assuming no re-use of heap pads, there will be 100 heap leaching cells, each with a capacity of 66,000 tons of material stacked to a height of 25 feet (ft) over an area of 40 ft by 100 ft. The mineral processing rate will be 500,000 tons per year or greater (Titan Uranium 2010).

Currently, the Wyoming Department of Environmental Quality has issued a fully bonded mining permit to Titan (now Energy Fuels). Energy Fuels is in the process of developing a source material license application for submittal to the NRC around mid-2011. The review and approval process is expected to take about 2 years (i.e., the NRC will complete it in mid-2013). Finally, the Plan of Operation (POO) is being developed and expected to be submitted to the U.S. Bureau of Land Management also around mid-2011. Submittal of the POO will trigger development of an environmental impact statement (EIS). This POO/EIS process is expected to be completed by the end of 2012 (Titan Uranium 2011).

3.5 Method 115 to Monitor Radon Emissions from Uranium Tailings

Subpart W (40 CFR 61.253) requires that compliance with the existing emission standards for uranium tailings be achieved through the use of Method 115, as prescribed in Appendix B to 40 CFR 61. Method 115 consists of numerous sections that discuss the monitoring methods that

must be used in determining the Rn-222 emissions from underground uranium mines, uranium mill tailings piles, phosphogypsum stacks, and other piles of waste material that emits radon.

For uranium tailings piles, Method 115, Section 2.1.3, specifies the minimum number of flux measurements considered necessary to determine a representative mean radon flux value for each type of region on an operating pile:

- Water covered area—no measurements required as radon flux is assumed to be zero.
- Water saturated beaches—100 radon flux measurements.
- Loose and dry top surface—100 radon flux measurements.
- Sides—100 radon flux measurements, except where earthen material is used in dam construction.

The requirement of 300 measurements may result in more measurements then are necessary under the Subpart W design standards. For example, under design standard 40 CFR 61.252(b)(2) for continuous disposal, only 10 acres are uncovered at one time. The 300 flux measurements on a 10-acre area translate into one measurement every 1,500 ft^2, or one every 40 ft. At the time Method 115 was developed and amended to Appendix B (i.e., 1989), the uranium tailings areas were much larger than the Subpart W design standards presently allow. For example, DOE/EIA-0592 (1995) indicates that some mills had tailings areas of over 300 acres (although not necessarily in a single pile).

Method 115, Section 2.1.6, indicates that measuring "radon flux involves the adsorption of radon on activated charcoal in a large-area collector." Since 1989, there have been advances in methods of measuring radon flux. George (2007) is particularly relevant in terms of radon measuring devices:

> *In the last 20 years, new instruments and methods were developed to measure radon by using grab, integrating, and continuous modes of sampling. The most common are scintillation cell monitors, activated carbon collectors, electrets, ion chambers, alpha track detectors, pulse and current ionization chambers, and solid state alpha detectors.*

In George (2007) radon detection is divided into:

I. Passive integrating radon measurements

(1) Activated carbon collectors of the open face or diffusion barrier type. Charcoal canisters often employ a gamma spectrometer to count the radon daughters as surrogates (bismuth-214, for example). Liquid scintillation vials also use alpha and beta counting. About 70% of radon measurements in the United States are canister type.

(2) Electret ion chambers are being used for 2–7 days duration to measure the voltage reduction (drop). The voltage drop on the electrets is proportional to the radon concentration. About 10%–15% of radon measurements use this methodology.

(3) Alpha track detectors are used for long-term measurements. Alphas from radon penetrate a plastic lattice, which is etched with acid, and the resulting tracks are counted. There is some use in the United States, but this is more popular in Europe.

II. Passive or active continuous radon measurements

(1) Scintillation cell monitors mostly include the flow-through type.

(2) Current and pulse ionization chambers (mostly passive).

(3) Solid state devices are either passive or active if they use a pump to move air through the sensitive volume of the monitor like the RAD 7, which uses a solid state alpha detector (passive implanted planar silicon (PIPS) detector).

Additionally, the Oak Ridge Institute for Science and Education (ORISE) compared various radon flux measurement techniques (ORISE 2011), including activated charcoal containers, the Electric Passive Environmental Radon Monitor (E-PERM) electret ion chamber, the AlphaGUARD specialized ionization chamber, semiconductor detectors to measure radon daughters, and ZnS(Ag) (silver doped zinc sulfide) scintillation detectors. ORISE stated that the last two techniques were not yet commercially available and that the AlphaGUARD detector was "expensive," and thus they are not currently candidates for radon flux monitoring of uranium tailings. Comparing the activated charcoal containers to the E-PERM, ORISE found that while both were easy to operate and relatively inexpensive, the E-PERM showed smaller variations in measurements, and the activated charcoal containers had higher post-processing costs. The only disadvantage of the E-PERM was that its Teflon disks must be replaced after each use. Based on this comparison, ORISE recommended that for a large number of measurements, such as those needed to comply with Subpart W, E-PERM flux monitors would be best.

This brief review of Method 115 demonstrates that its use can still be considered current for monitoring radon flux from uranium tailings. However, it is important to note that the specific design protocols were developed for use at larger tailings impoundments. Alternatively, many commercial enhancements to that design are widely available and in use today. Other forms of passive detectors, as well as active measurement detectors, are also acceptable alternatives to demonstrate conformance with the standard. In addition, the method as currently written has some elements and requirements that should be reviewed and possibly revised, particularly the location and the frequency of measurement. These would be better based on statistical considerations or some other technical basis. Additional discussion of the continued applicability of Method 115 appears in SC&A 2008, ORISE 2011, and George 2007.

4.0 CURRENT UNDERSTANDING OF RADON RISK

Subpart W regulates the emission of radon from operating uranium recovery facility tailings. To enhance the understanding of the need for Subpart W, this section presents a qualitative review and analysis of changes in the analysis of the risks and risk models associated with radon releases from uranium recovery tailings since the publication of the 1989 BID (EPA 1989). After presenting some brief radon basics, the analysis focuses on three areas that have evolved: radon progeny equilibrium fractions, empirical risk factors, and the development of dosimetric risk factors. Finally, Section 4.4 presents the results of a risk assessment performed using current methodology (i.e., CAP88, Version 3 (TEA 2007)), 2011 estimated population distributions, and historical radon release data. Section 4.4 also discusses and compares the current calculated risks to the 1989 risk assessment results, presented in Section 2.3.

4.1 Radon and Dose Definitions

Rn-222 is a noble gas produced by radioactive decay of Ra-226. As shown in Figure 12, one of the longer-lived daughters in the uranium (U)-238 decay series, Ra-226 is a waste product in uranium tailings and liquids from uranium recovery facilities. These include mills, evaporation and surge ponds, typically found in ISL facilities, and heap leach piles. Radium (and its daughter radon) is also part of the natural radiation environment and is ubiquitous in soils and ground water along with its parent uranium.

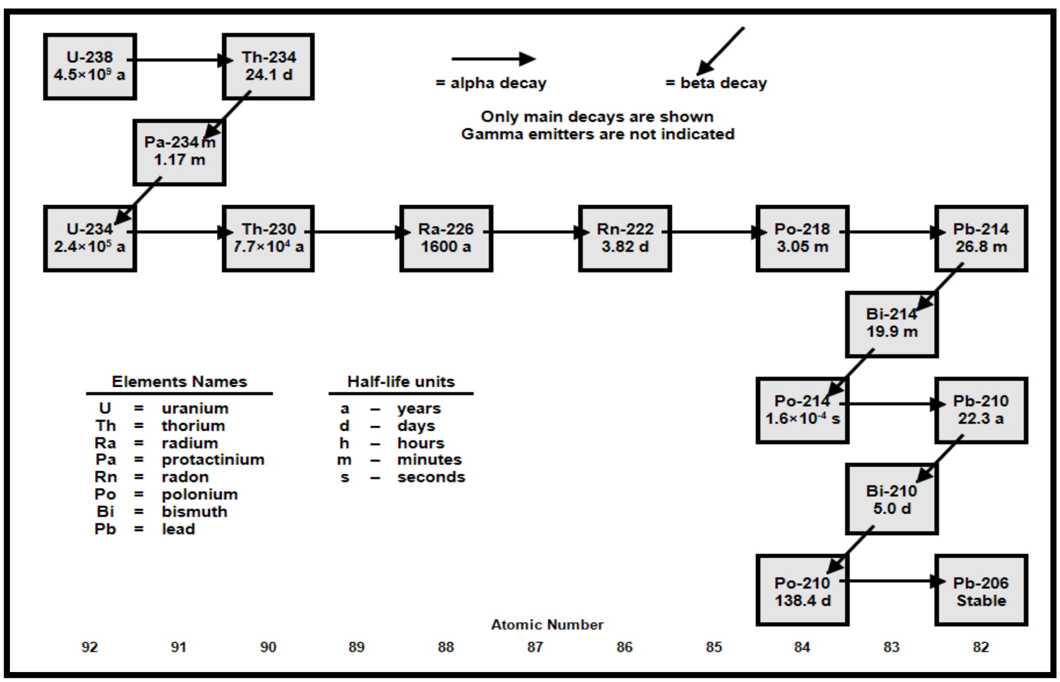


Figure 12: Uranium Decay Series

Radon, with a half-life of 3.8 days, decays into a series of short half-life daughter products or progeny. Being chemically inert, most inhaled radon is quickly exhaled. Radon progeny, however, are charged and electrostatically attach themselves to inhalable aerosol particulates, which are deposited in the lung or directly onto lung tissue. These progeny undergo decay,

releasing alpha, beta, and gamma radiation that interacts directly with lung tissue. Of these interactions, alpha particles from polonium-218 and polonium-214 are the most biologically damaging. The resulting irritation of lung cell tissue particularly from these alpha particles enhances the risk of developing a lung cancer. Determining an estimate of the risk of developing a cancer is of primary importance to establishing the basis for any regulatory initiatives.

4.2 Radon Risk Factors

In 1988, the National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) presented a report on the health risks of radon (BEIR IV, NAS 1988). BEIR IV derived quantitative risk estimates for lung cancer from analyses of epidemiologic data from underground miners. The risk factor presented in BEIR IV for radon was 350 cancer deaths per million person-WLMs[5] of exposure.

The International Commission on Radiological Protection (ICRP), in its Publication 50 (ICRP 1987), addressed the question of lung cancer risk from indoor radon daughter exposures. The ICRP Task Group took a direction quite different from that of the BEIR Committee. The Task Group reviewed published data on three miner cohorts: U.S., Ontario, and Czech uranium miners. When the ICRP 50 relative risk model was run with the 1980 U.S. life table and vital statistics, the combined male and female reference risk was calculated in the 1989 BID to be 4.2×10^{-4} cancer deaths per WLM.

In the 1989 BID, EPA averaged the male and female BEIR IV and ICRP 50 risk coefficients and adjusted the coefficients for background, so that the risk of an excess lung cancer death for a combined population (men and women) was 3.6×10^{-4} WLM^{-1}, with a range from 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1} (EPA 1989).

In addition to epidemiological radon risk coefficients, dosimetric models have been developed as a widely acceptable approach to determine the effects of exposures to radon progeny. One of the principal dosimetric models used to calculate doses to the lung following inhalation of radon and its daughters is the ICRP Human Respiratory Tract Model (HRTM), first introduced in ICRP Publication 66 (ICRP 1994). The ICRP used the HRTM to develop a compilation of effective dose coefficients for the inhalation of radionuclides, presented in Publication 72 (ICRP 1996).

Shortly after the publication of ICRP Publication 72, and using the information in that report, EPA developed Federal Guidance Report 13 (FGR 13) (EPA 1999)[6]. In addition to the risk factors given in FGR 13 itself, the FGR 13 CD Supplement (EPA 2002) provides dose factors, as well as risk factors, for various age groups. For this study, the dose and risk factors from the

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[5] Radon concentrations in air are commonly expressed in units of activity (e.g., picocuries (pCi) or becquerels) per unit volume (e.g., liters (L)); however, radon progeny concentrations are commonly expressed as working levels (WLs). In a closed volume, the concentration of short-lived radon progeny will increase until equilibrium is reached, under these conditions, each pCi/L of radon will give rise to (almost precisely) 0.01 WL, or 100 pCi/L = 1 WL (EPA 2003). Exposure to 1 WL for 1 month (i.e., 170 hours) is referred to as 1 working level month (WLM).

[6] Since FGR 13 was published, several organizations have produced updated radiation risk estimates. EPA 2011 reviewed the update risk estimates and concluded that the new mortality estimates do not differ greatly from those in FGR-13.

FGR 13 CD Supplement were used to calculate the dose and risk due to exposure to 1 WLM of radon and its progeny. The calculation assumed a radon airborne concentration of 100 pCi/L, a radon progeny equilibrium fraction of 0.4, a breathing rate of 0.9167 cubic meters per hour (m^3/hr), and an exposure duration of 170 hours.

The results of this calculation demonstrate that the FGR 13 based radon progeny lung dose conversion factor is between about 2.1 to 7.0 millisieverts (mSv)/WLM, depending on the age of the individual being exposed. The results also show that the lifetime fatality coefficient from lung exposure is between about 6×10^{-4} to 2.4×10^{-3} WLM^{-1}, depending on the exposed individual's age. This agrees well with the factor calculated from empirical data.

In conclusion, the radon progeny risk factor from FGR 13 of 6×10^{-4} WLM^{-1} used in this analysis falls within the risk factor range identified in the 1989 BID (i.e., 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1}), and is about 67% larger than the 3.6×10^{-4} WLM^{-1} radon progeny risk factor used in the 1989 BID. Thus, the radon progeny risk factor used in this Subpart W analysis updates the risk factor used in the 1989 BID to reflect the current understanding of the radon risk, as expressed by the ICRP and in FGR 13.

4.3 Computer Models

Various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium mines were compared. Seven computer programs were considered for use in the uranium tailings radon risk assessment: CAP88 Version 3.0, RESRAD-OFFSITE, MILDOS, GENII, MEPAS, AIRDOS, and AERMOD. A detailed selection process was used to select the program from the first five programs listed. AIRDOS was not included in the detailed selection process, since it is no longer an independent program, but has been incorporated into CAP88 Version 3.0. Because it calculates only atmospheric dispersion, but not radiological doses or risks, AERMOD was also not included. The five remaining programs received a score between 0 and 5 for each of the following 11 criteria: (1) Exposure Pathways Modeled, (2) Population Dose/Risk Capability, (3) Dose Factors Used, (4) Risk Factors Used, (5) Meteorological Data Processing, (6) Source Term Calculations, (7) Verification and Validation, (8) Ease of Use/User Friendly, (9) Documentation, (10) Sensitivity Analysis Capability, and (11) Probabilistic Analysis Capability. Also, each criterion had a weighting factor of between 1 and 2. The total weighted score was calculated for each code, and CAP88 was selected for use in this evaluation. A more complete discussion of the selection of the risk assessment computer code appears in SC&A 2010.

As described in Section 2.3, the 1989 BID used the computer codes AIRDOS-EPA, RADRISK, and DARTAB to calculate the risks due to radon releases from uranium tailings. Subsequent to the publication of the 1989 BID, CAP88 Version 3.0 was produced. CAP88 Version 3.0 was originally composed of the AIRDOS-EPA and DARTAB computer codes and the dose and risk factors from RADRISK (see Section 2.3). CAP88 Version 3.0 was first used for DOE facilities to calculate effective dose equivalents to members of the public to ensure compliance with the then-issued NESHAP Subpart H rules (TEA 2007). Currently, CAP88 Version 3.0 incorporates the dose and risk factors from FGR 13 for determining risks from radionuclides, including the radon decay daughters.

When calculating doses and risk from Rn-222, CAP88 Version 3.0 can be run in two different modes, either normally or in the "radon only" mode. When run in the normal mode, CAP88 Version 3.0 treats radon and its progeny as any other radionuclide and its progeny would be treated. That is, the radon is decayed as it travels from the release point to the dose receptor location, and the in-growth of the progeny is calculated. At the dose receptor location, doses are calculated assuming all the normal exposure pathways, including inhalation and air submersion, that are normally associated with radon doses, and also the exposure pathways from the longer lived radon progeny that deposit onto the ground, including ground shine and food ingestion. To perform these calculations, CAP88 Version 3.0 used the dose and risk factors from FGR 13.

In the "radon only" mode, CAP88 Version 3.0 calculates the risk from the radon WL concentration, but not the dose. The annual risk to an individual or population at a location is simply the WL concentration multiplied by a risk coefficient. The risk coefficient used by CAP88 Version 3.0 is 1.32 cancer fatalities per year per WL. Although this risk coefficient is not documented in any of the CAP88 Version 3.0 user manuals, so its origin is unknown, it can be derived from the CAP88 Version 3.0 output files. A risk coefficient of 1.32 $WL\text{-}year^{-1}$ is equivalent to 2.56×10^{-2} cancer deaths per WLM, which is about two orders of magnitude larger than the risk coefficient discussed in Section 4.2. Thus, CAP88's "radon only" mode was not used to calculate the risk estimates that are summarized in the next section. Rather, the risk estimates are based on CAP88's atmospheric transport model (for radon decay and progeny buildup) and the radionuclide-specific risk factors from FGR 13.

4.4 Uranium Recovery Facility Radon Dose and Risk Estimates

To perform the CAP88 dose/risk analysis, three types of data were necessary: (1) the distribution of the population living within 80 km (50 mi) of each site, (2) the meteorological data at each site, particularly the wind speed, wind direction, and stability class, and (3) the amount of radon annually released from the site.

Dose/risk assessments were performed for the uranium recovery sites identified in Table 12, which include conventional uranium mills and ISL mines, plus two hypothetical generic sites developed to represent the western and eastern United States.

Table 12: Uranium Recovery Sites Analyzed

Mill / Mine	Type	State	Regulator	Latitude			Longitude		
				deg	min	sec	deg	min	sec
Crow Butte	In-Situ Leach	NE	NRC	42	38	41	-103	21	8
Western Generic	Conventional	NM	NRC	35	31	37	-107	52	52
Alta Mesa 1, 2, 3	In-Situ Leach	TX	State	26	53	59	-98	18	29
Kingsville Dome 1,3	In-Situ Leach	TX	State	27	24	54	-97	46	51
White Mesa Mill	Conventional	UT	State	37	34	26	-109	28	40
Eastern Generic	Conventional	VA	NRC	38	36	0	-78	1	11
Smith Ranch - Highland	In-Situ Leach	WY	NRC	43	3	12	-105	41	8
Christensen/Irigaray	In-Situ Leach	WY	NRC	43	48	15	-106	2	7
Sweetwater Mill	Conventional	WY	NRC	42	3	7	-107	54	41

Normally, the population doses and risks are calculated out to a distance of 80 km (50 mi) from the site. Therefore, it was necessary to know the population to a distance of 80 km from each site in each of the 16 compass directions. This information is not normally available from U.S. Census Bureau data. However, in 1973, EPA wrote a computer program, SECPOP (Sandia 2003), which would convert census block data into the desired 80-km population estimates for any specific latitude and longitude within the continental United States. The NRC adopted this program to perform siting reviews for license applications and has updated the program to use the 2000 census data. SC&A (2011) used the SECPOP program to estimate the population distribution around each site; that population was then modified to account for changes in the population from 2000 to 2010.

For those sites where site-specific meteorological data were identified, those site-specific data were used. For other sites, CAP88 Version 3.0 is provided with a weather library of meteorological data from over 350 National Weather Service stations. For sites without site-specific meteorological data, data from the National Weather Service station nearest the site were used.

Annual radon release estimates were determined for each site based on the available documentation for the site. For example, some sites reported their estimated radon release in their semiannual release reports, while other sites calculated their radon release as part of their license application or renewal application. Finally, for some sites, the annual radon release estimates were obtained from the NRC-produced, site-specific environmental assessment. If multiple documents provided radon release estimates for a particular site, the estimate from the most recent document was used. Consistent with the 1989 assessment, in order to bound the risks, radon releases were estimated from both process effluents and impoundments. Likewise, if both theoretical and actual radon release values were identified for a site, the actual radon release value was given preference.

Additional descriptions of each site's population, meteorology, and radon source term may be found in SC&A 2011. Doses and risks to the RMEI and to the population living within 80 km of the facility were calculated. The RMEI is someone who lives near the facility and is assumed to have living habits that would tend to maximize his/her radiation exposure. For example, the RMEI was assumed to eat all of his/her vegetables from a garden located nearest the facility, which is contaminated with radon progeny as a result of radon releases from the facility. On the other hand, population doses and risks are based on the number of individuals who live within 80 km of the facility. These people are also assumed to eat locally grown vegetables, but not necessarily from the garden located nearest the facility. The RMEI's dose and risk are included within the population dose and risk, since he/she lives within the 80-km radius.

Table 13 presents the RMEI and population doses and risks due to the maximum radon releases estimated for each uranium site.

Table 13: Calculated Maximum Total Annual RMEI, Population Dose and Risk

Uranium Site	Maximum Radon Release (Ci/yr)	Annual Dose		LCF[a, b] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	0.5	1.2	2.9E-06	6.0E-07
White Mesa	1,750	5.2	12.0	3.4E-05	6.4E-06
Smith Ranch - Highlands	36,500	3.7	1.5	2.3E-05	7.7E-07
Crow Butte	8,885	2.7	3.3	1.7E-05	1.7E-06
Christensen/Irigaray	1,600	3.8	1.9	2.4E-05	9.9E-07
Alta Mesa	740	21.6	11.5	1.3E-04	6.1E-06
Kingsville Dome	6,958	58.0	11.3	3.8E-04	6.1E-06
Eastern Generic	1,750	200.3	28.2	1.4E-03	1.6E-05
Western Generic	1,750	5.1	6.0	2.7E-04	7.7E-06

[a]Latent Cancer Fatalities
[b]In this table all risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39.

Table 14 presents the RMEI and population doses and risks due to the average radon releases estimated for each uranium site. The risks were based on average radon releases to make it easier to convert these annual risk values into lifetime risk values. This conversion is done by simply multiplying the Table 14 values by the number of years that the facility operates for the population risk, or by the length of time that the individual lives next to the facility for the RMEI risk.

Table 14: Calculated Average Total Annual RMEI, Population Dose and Risk

Uranium Site	Average Rado n Release (Ci/yr)	Annual Dose		LCF[a] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Populatio n	RMEI
Sweetwater	1,204	0.3	0.7	1.7E-06	3.5E-07
White Mesa	1,388	3.0	7.0	2.0E-05	3.7E-06
Smith Ranch - Highland s	21,100	2.2	0.9	1.3E-05	4.5E-07
Crow Butte	4,467	1.6	1.9	1.0E-05	1.0E-06
Christensen/Irigaray	1,040	2.2	1.1	1.4E-05	5.7E-07
Alta Mesa	472	12.5	6.7	7.6E-05	3.6E-06
Kingsville Dome	1,291	33.6	6.6	2.2E-04	3.5E-06
Eastern Generic	1,388	116.3	16.4	7.9E-04	9.2E-06
Western Generic	1,388	3.0	3.5	1.6E-04	4.4E-06

[a]Latent Cancer Fatalities

The dose and risk to an average member of the population within 0–80 km of each site may be calculated by dividing the population doses and risks from Table 13 and Table 14 by the population for each site. Table 15 shows the results of that calculation.

Table 15: Dose and Risk to an Average Member of the Population

Uranium Site	Dose (mrem)		LCF[(a)] Risk (yr^{-1})	
	Average Release	Maximum Release	Average Release	Maximum Release
Sweetwater	0.03	0.05	1.6E-07	2.7E-07
White Mesa	0.15	0.25	9.6E-07	1.6E-06
Smith Ranch - Highlands	0.03	0.05	1.7E-07	2.9E-07
Crow Butte	0.05	0.08	3.1E-07	5.3E-07
Christensen/Irigaray	0.06	0.11	3.8E-07	6.6E-07
Alta Mesa	0.03	0.05	1.6E-07	2.7E-07
Kingsville Dome	0.07	0.13	4.8E-07	8.3E-07
Eastern Generic	0.05	0.09	3.7E-07	6.4E-07
Western Generic	0.04	0.07	2.2E-06	3.8E-06

[(a)]Latent Cancer Fatalities

As Table 15 shows, the annual latent cancer fatality (LCF) risk to an average member of the population surrounding a uranium site ranges from 1.6×10^{-7} to 1.6×10^{-6} for the seven actual sites, and from 3.7×10^{-7} to 3.8×10^{-6} for the two hypothetical generic sites.

The study estimated that the annual fatal cancer risk to the RMEI ranges from 3.5×10^{-7} to 6.4×10^{-6} for the seven actual sites, and from 4.4×10^{-6} to 1.6×10^{-5} for the two hypothetical generic sites. The highest annual individual risk occurred at the Eastern Generic site, which is not surprising considering that the nearest individual was assumed to reside only about 1 mi from the hypothetical site. It is likely that during the site selection process for an actual facility, a site this close to residences would be eliminated and/or the design of the facility would include features for reducing radon emissions in order to reduce the RMEI risk.

The lifetime risk would depend on how long an individual was exposed. For example, for the seven actual sites analyzed, assuming that the uranium mill operates for 10 years, then the lifetime fatal cancer risk to the RMEI would be 3.5×10^{-6} to 3.7×10^{-5}. Alternatively, if it is assumed that an individual was exposed for his/her entire lifetime (i.e., 70 years), then the lifetime fatal cancer risk to the RMEI would be 2.45×10^{-5} to 2.59×10^{-4}. For the two hypothetical generic sites, the lifetime fatal cancer risk to the RMEI would be 4.4×10^{-5} to 9.2×10^{-5} assuming 10 years of mill operation, or 3.1×10^{-5} to 6.44×10^{-5} assuming 70 years of mill operation. The lifetime risk calculation uses only the average radon release results, because while the maximum could occur for a single year, it is unlikely that the maximum would occur for 10 or 70 continuous years.

The study also estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 km of the sites.

4.5 Summary of Radon Risk

This section described the evolution in the understanding of the risk presented by radon and its progeny since the 1989 BID was published. Additionally, the computer code CAP88 Version 3.0 was used to analyze the radon risk from seven operating uranium recovery sites and two generic sites.

The lifetime MIR calculated using data from seven actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments (see Section 2.3.1), while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments (see Section 2.3.2).

In protecting public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}) the lifetime MIR. Although the calculated high end of the lifetime MIR range is above 10^{-4}, the assumptions that radon releases occur continuously for 70 years and that the same RMEI is exposed to those releases for the entire 70 years are very conservative.

Similarly, the risk assessment estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years among the 1.8 million persons living within 80 km of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km of the sites was 0.0043, which was less than one case every 200 years for existing impoundments, and 0.014, or approximately one case every 70 years for new impoundments (see Sections 2.3.1 and 2.3.2).

5.0 EVALUATION OF SUBPART W REQUIREMENTS

The evaluation of Subpart W requirements required analyses of several items to determine if the current technology had advanced since the promulgation of the rule. These topics are listed below, along with the key issues addressed in this report to determine whether the requirements of Subpart W are necessary and sufficient.

5.1 Items Reviewed and Key Issues

Each of these items will be reviewed with reference to the relevant portions of this document:

(1) Review and compile a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed.

    Key Issue – The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures and facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

(2) Compare and contrast those technologies with the engineering requirements of hazardous waste impoundments regulated under RCRA Subtitle C disposal facilities, which are used as the design basis for existing uranium byproduct material (i.e., tailings) impoundments.

Key Issue – All new impoundments shall adopt the design and engineering standards referred to through 40 CFR 192.32(a)(1).

(3) Review the regulatory history.

Key Issue – NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.

(4) Tailings impoundment technologies.

Key Issue – The emission limit for impoundments that existed as of December 15, 1989, has been demonstrated to be both achievable and sufficient to limit risks to the levels that were found to protect public health with an ample margin of safety.

The requirement that impoundments opened after December 15, 1989, use either phased or continuous disposal technologies as appropriate to ensure that public health is protected with an ample margin of safety, which is consistent with section 112(d) of the 1990 Amendments of the CAA, which requires standards based on GACT.

(5) Radon measurement methods used to determine compliance with the existing standards.

Key issue – The approved method (Method 115, 40 CFR 61, Appendix B) of monitoring Rn-222 to demonstrate compliance with the emission limit for impoundments that existed as of December 15, 1989, is still valid.

(6) Compare the 1989 risk assessment with current risk assessment approaches.

Key Issue – Adoption of a lower emission limit is not necessary to protect public health, as the current limit has been shown to be protective of human health and the environment. Impact costs associated with the limit are considered to be acceptable.

5.1.1 Existing and Proposed Uranium Recovery Facilities

Sections 3.2, 3.3, and 3.4 describe the three types of uranium recovery facilities: conventional mills, ISL facilities, and heap leach facilities. Each facility type is briefly described below.

Conventional Mills

Section 3 of this report presents a review of the existing and proposed uranium recovery facilities. As indicated, there are five conventional mills at various stages of licensing, with various capacities to receive tailings. Of these five conventional mills, only White Mesa is

operational. Some of these were constructed before December 15, 1989, and fall under the Subpart W monitoring requirement. Table 16 shows the current conventional mills with pre-December 15, 1989 conventional impoundments.

Table 16: Current Pre-December 15, 1989 Conventional Impoundments

Conventional Mill Name	Regulatory Status	Pre-December 15, 1989 Impoundments
Sweetwater	Standby,* license expires November 2014	37 acres not full
Shootaring Canyon	Standby,* license extension May 2013	Only 7 acres of impoundment filled
White Mesa	Active, license expires March 2015	Cell 2 closed, Cell 3 almost full

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

The White Mesa Mill (see Section 3.2.2) has one pre-1989 cell (Cell 3) that is authorized to accept tailings and is still open. Cell 2 is closed. Both cells are monitored for radon flux. The average radon flux for Cell 2 was calculated at 13.5 pCi/(m^2-sec), while that at Cell 3 was 8.9 pCi/(m^2-sec). The mill also uses an impoundment constructed before 1989 as an evaporation pond.

The Sweetwater Mill (see Section 3.2.1) has a 60-acre tailings management area with a 37-acre tailings impoundment of which 28 acres are dry with an earthen cover. The remainder is covered by water. The radon flux from this impoundment is monitored yearly. The average flux (using Method 115) for the entire impoundment was 6.01 pCi/(m^2-sec), including the water-covered area, which had an assumed flux of zero.

The Shootaring Canyon Mill (see Section 3.2.3) had plans for an upper and lower impoundment, but only the upper impoundment was constructed. As the mill operated for approximately 30 days, only about 7 acres of tailings were deposited in the upper impoundment. These have a soil cover. The average radon flux from the covered tailings was measured using Method 115 at 11.9 pCi/(m^2-sec) in April 2010.

The Piñon Ridge Mill (see Section 3.2.4) is a permitted conventional uranium recovery facility in Montrose County, Colorado. The facility has not been constructed; however, there are current activities at the site, including a pre-operational environmental monitoring program.

In-Situ Recovery

As discussed in Section 3.3, ISL was first conducted in 1963 and soon expanded so that by the mid-1980s, a fair proportion of the recovered uranium was by ISL. Table 8shows the ISL facilities in the United States that are currently operational. As previously discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining. Thus, approximately 23 facilities are restarting, expanding, or planning for new operations (see Table 9).

Of particular importance to Subpart W are the impoundments that are an integral part of all ISL facilities. These impoundments are required to maintain the hydrostatic gradient toward the leach

field to minimize excursions referred to as “flare,” a proportionality factor designed to estimate the amount of aquifer water outside of the pore volume that has been impacted by lixiviant flow during the extraction phase. While these impoundments typically do not reach the size and scale of conventional tailings piles, they are an integral component of ISL, contain various amounts of radium, and can function as sources of radon gas. Section 3.3.1 provides the mathematical framework for estimating the quantity of radon being emitted from an impoundment. The subsequent discussion of Subpart W, including a proposed standard for impoundments constructed after December 15, 1989, will further evaluate this radon flux.

Heap Leach Facilities

The few commercial heap leach facilities established in the 1980s have been shut down. Recently, however, two heap leach facilities have been proposed: one in Wyoming (Sheep Mountain – Energy Fuels) and one in New Mexico (Grants Ridge, Uranium Energy Corporation) (see Section 3.4). If the price of uranium increases, then recovery of uranium from heap-leaching low-grade ores will become economically attractive and will likely lead to additional facilities. The question to be addressed from the standpoint of Subpart W is the radon flux released from the active heap leach pile. Also, once the uranium is removed from the ore in the heap leach pile, the spent ore becomes a byproduct material much like the tailings, albeit not mobile. This spent ore contains radium that releases radon. As the heap leach pile is constructed to allow lixiviant to “trickle through” the pile, these same pathways could allow for radon release by diffusion out of the spent ore and then through the pile, which is addressed under Subpart W.

5.1.2 RCRA Comparison

Both alternative disposal methods presented in Subpart W (work practices) require that tailings impoundments constructed after December 15, 1989, meet the requirements of 40 CFR 192.32(a)(1). Tailings impoundments include surface impoundments, which are defined in 40 CFR 260.10:

> *Surface impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.*

The above definition encompasses conventional tailings ponds, ISL ponds, and heap leach piles. The last is included as it is assumed that the heap leach pile will be diked or otherwise constructed so as not to lose pregnant liquor coming from the heap.

This being the case, 40 CFR 264.221(a) states that the impoundment shall be designed and constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Requirements of the liner system listed in 40 CFR 264.221(c) include:

(1)(i)(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life.

(1)(i)(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 ft (91 centimeters (cm)) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec).

The regulation also requires a leachate collection system:

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system.* This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period.

Other requirements for the design and operation of impoundments, given in 40 CFR 264 Subpart K, include construction specifications, slope requirements, and sump and removal requirements. The above requirements are important to new uranium containment/impoundment systems because of the potential that water will be used to limit the radon flux from a containment/impoundment. Thus, it is also important to minimize the potential for ground water or surface water contamination. For conventional mill tailings impoundments, the work practices require a soil cover. With heap leach piles, the moisture in the heap would limit radon during operations, and after operations, a degree of moisture would be required to ensure that the radon diffusion coefficient is kept low (see Section 5.4).

5.1.3 Regulatory History

Section 2.0 reviewed the regulatory history of Subpart W. This review indicates that NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator’s duty under the CAA. The following presents the use of GACT (see Section 5.3) in detail and describes its use in conventional and other than conventional uranium recovery.

5.1.4 Tailings Impoundment Technologies

Sections 2.3.1 and 2.3.2 discuss tailings impoundment technologies. The two primary changes to the technology as it was previously practiced were first that owners and/or operators of conventional mill tailings impoundments must meet the requirements of 40 CFR 192.32(a)(1) and second that they must adhere to one of the two work practices previously discussed (for

impoundments constructed after December 15, 1989). Within these limits, tailings impoundment technologies have had no fundamental changes.

5.1.5 Radon Measurement Methods

As previously described, Subpart W defines two separate standards. The first states that existing sources (as of December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA that shows the results of the compliance monitoring (see Section 3.5). As pointed out in Appendix B, the focus of the monitoring was on the beaches, tops, and sides of conventional piles. The radon flux from the water-covered portion of the tailings pile was assumed to be zero. Although regulated under Subpart W, it is unclear how to monitor the radon flux off the surface of evaporation ponds at conventional mills, ISLs, or heap leach facilities. Since these ponds are considerably smaller than tailings impoundments, the solution was to specify that as long as the water cover is 1 meter or more during the active life of the pond, no monitoring is necessary (see Section 3.3.1).

Section 3.3.1 also shows that, for evaporation ponds at ISL facilities, the radon flux from the surface is a function of the wind speed and the concentration of radium in the water. Estimates using actual ISL data showed the contribution to the sites' total radon release to be less than 1% of the total. In any case, the radon flux can also be reduced by co-precipitating the radium using barium chloride ($BaCl_2$) co-precipitation treatment to reduce the radium concentration.

For impoundments constructed on or after December 15, 1989, monitoring is not required. Rather, Subpart W requires that these impoundments comply with one of two work practice standards: the first practice limits the size of the impoundment to 40 acres or less, which limits the radon source, while the second practice of continuous disposal does not allow uncovered tailings to accumulate in large quantities, which also limits radon emissions.

For evaporation ponds or holding ponds as in the pre-December 15, 1989, case, a 1-meter cover of water should be sufficient to limit the radon flux to the atmosphere (see Section 3.3.1). Thus, the proposed GACT is that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size or area restriction, and that during the active life of the pond at least 1 meter of liquid be maintained in the pond.

The last facility is the potential heap leach pile. Subpart W applies to the material in the pile as byproduct material is being generated. Considering a small section of the pile as the leach (acid or base) solubilizes the uranium, the material left is byproduct material. The result is a material similar to tailings and the heap is also wet. It is assumed that if the moisture content is greater than 30%, the heap is not dewatered. As long as the heap is not dewatered, the radon diffusion coefficient is such that minimal radon will escape the heap leach pile.

Heap Leach Radon Flux

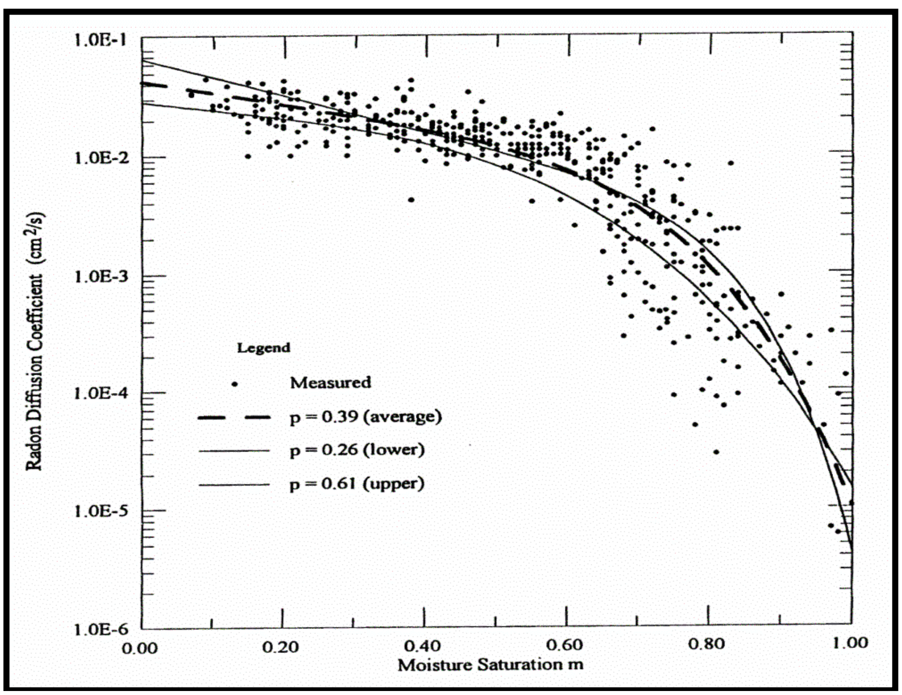
A possible source of radon from a heap leach pile is from the surface of the pile. Assuming that the heap pile is more than 1 or 2 meters thick, the radon flux from this configuration can be estimated from the following formula (NRC 1984):

$$J = 10^4 R \rho E \sqrt{\lambda D_e} \qquad (5\text{-}1)$$

Where

J	=	radon flux (pCi/(m^2-sec))
10^4	=	units conversion (cm^2/m^2)
R	=	specific activity of radium (pCi/g)
ρ	=	dry bulk density of material (1.8 g/cc)
E	=	emanation coefficient
λ	=	radon decay constant (2.11×10^{-6} sec^{-1})
D_e	=	radon diffusion coefficient (cm^2/sec)
	=	$D_0\, p\, exp[-6\, m\, p\, -6\, m^{14\, p}]$ (5-2)
D_0	=	radon diffusion coefficient in air (0.11 cm^2/sec)
m	=	moisture saturation fraction
p	=	total porosity

The above empirical expression for the radon diffusion coefficient was developed by Rogers and Nielson (1991), based on 1,073 diffusion coefficient measurements on natural soils. Figure 13 shows that the diffusion coefficient calculated using the empirical expression agrees well with the measured data points over the whole range of moisture saturation at which diffusion coefficient measurements were made.



Source: Rogers and Nielson 1991, as reported in Li and Chen 1994

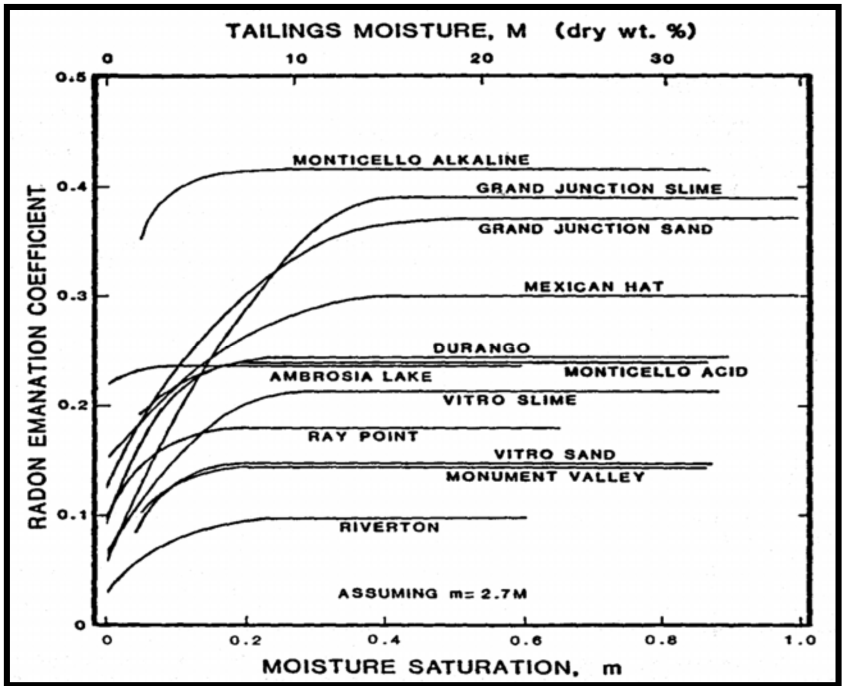
Figure 13: Diffusion Coefficient as a Function of Moisture Saturation

Figure 13 also demonstrates that as the moisture increases, the radon diffusion coefficient decreases significantly. This is because radon diffuses 10,000 times more slowly in water than it does in air (Drago 1998, as reported in Brown 2010). Therefore, adding moisture to the radium-containing material (whether it be a tailings pile or a heap pile) would decrease the diffusion coefficient, thereby increasing the time it takes for radon to diffuse out of the material and allowing more radon to decay before it can be released. As Figure 13 shows, the decrease in the radon diffusion coefficient can be significant, especially at high moisture levels.

However, in addition to the radon diffusion coefficient, the radon emanation coefficient is sensitive to the amount of moisture present. When a radium atom decays, one of three things can happen to the resulting radon atom: (1) it may travel a short distance and remain embedded in the same grain, (2) it can travel across a pore space and become embedded in an adjacent grain, or (3) it is released into a pore space. The fraction of radon atoms released into the pore space is termed the "radon emanation coefficient" (Schumann 1993). As soil moisture increases, it affects the emanation coefficient by surrounding the soil grains with a thin film of water, which slows radon atoms as they are ejected from the soil grain, increasing the likelihood that the radon atom will remain in the pore space. Research by Sun and Furbish (1995) describes this relationship between moisture saturation and the radon emanation rate:

> *The greater the moisture saturation is, the greater the possible radon emanation rate is. With moisture contents from 10% up to 30%, the recoil emanation rates quickly reach the emanation rate of the saturated condition. As the moisture reaches 30%, a universal thin film on the pore surface is formed. This thin film is sufficient to stop the recoil radon from embedding into another part of the pore wall.*

Figure 14 shows that the radon emanation coefficient can vary considerably for different tailings piles. Figure 14 also agrees with Sun and Furbish (1995) in that it shows that the emanation coefficient tends to level off when the moisture saturation level is above approximately 30%.



Source: NRC 1984

Figure 14: Emanation Coefficient as a Function of Moisture Content and Moisture Saturation

In conclusion, a moisture saturation level of up to about 30% tends to increase the radon emanation coefficient and decrease the radon diffusion coefficient, such that the amount of radon released from the pile could increase with increasing moisture. Above about 30% moisture saturation, the radon emanation coefficient is unchanged by increasing moisture, while the radon diffusion coefficient continues to decrease. Figure 15 shows the total effect of moisture on the radon flux. Equation 5-1 was used to develop Figure 15, along with the Rogers and Nielson (1991) empirical equation for the diffusion coefficient, an approximation of the Vitro Sand emanation coefficient from Figure 14, and a porosity of 0.39. Figure 15 does not show the radon flux values, since they would vary depending on the radium concentration and would not affect the shape of the curve.

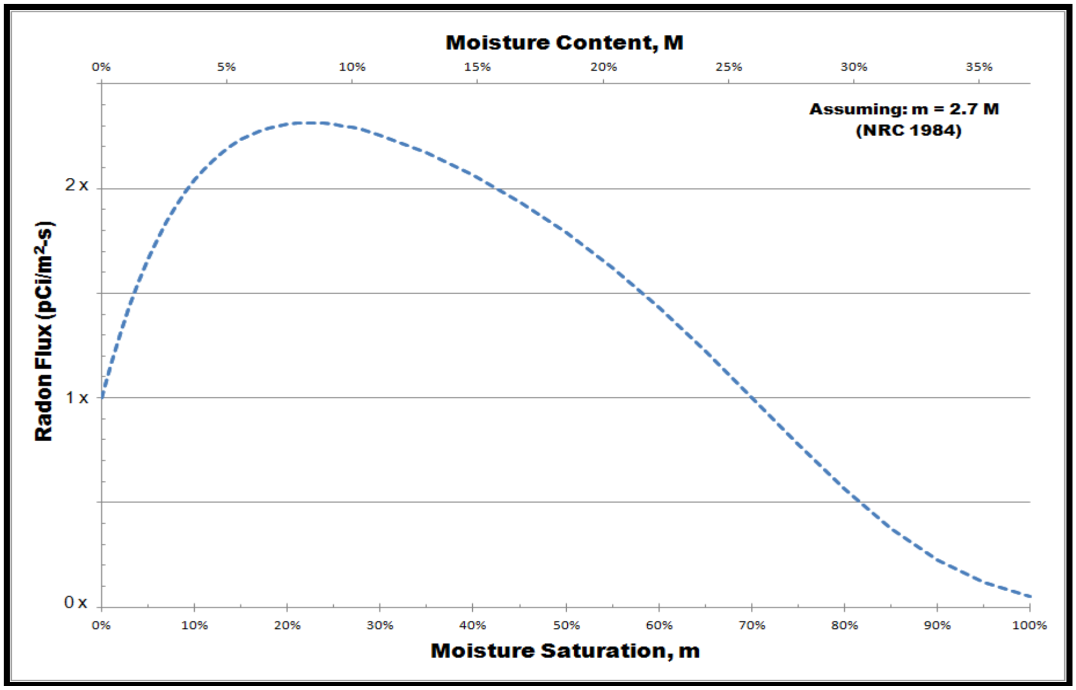


Figure 15: Radon Flux as a Function of Moisture Saturation and Moisture Content

Figure 15 shows that the radon flux starts low and increases as the moisture saturation increases due to the emanation coefficient. At between 20% and 30% moisture saturation, the flux reaches a peak that is about 2½ times the flux at zero moisture, after which the diffusion coefficient takes control and the flux decreases. Figure 15 is consistent with the results reported by Hosoda et al. (2007) in their study of the effect of moisture on the emanation of radon and thoron gases from weathered granite soil:

> *A sporadic increase in the radon and thoron exhalation rates was caused by the increase in the moisture content up to 8%* [27% moisture saturation]. *However, the exhalation rates showed a decreasing tendency with the increase in moisture content over 8%…, both measured and calculated radon exhalation rates had similar trends with an increase in the moisture content in the soil.*

The final point from Figure 15 is that the radon flux with a moisture content of 70% or greater is less than the flux at zero moisture, and that with a porosity of 0.39, 70% moisture saturation is equivalent to 27% moisture by weight. Thus, 30% moisture by weight would result in a radon flux significantly below the zero moisture flux.

5.1.6 Risk Assessment

Section 4.4 presents the results of a risk assessment performed for seven actual uranium recovery sites plus two generic uranium recovery sites. This risk assessment used the CAP88 Version 3.0 analytical computer model, which, as described in Section 4.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Additionally, this assessment used the latest radon dose and risk coefficients (i.e., millirem

(mrem)/picocurie (pCi) and LCF/pCi) from FGR 13. Both the 1989 assessment and this assessment used site-specific meteorological data. This assessment used 2000 census data, updated to 2010, whereas the 1989 assessment used 1983 data. Finally, as stated above, this assessment used actual historical radon releases from the uranium recovery sites, whereas because of the lack of site-specific data, the 1989 assessment assumed a radon release rate based on 1 pCi/(m^2-sec) Rn-222 emitted per pCi/g Ra-226 during both the operating, standby, drying, and/or disposal phase, and either 20 pCi/(m^2-sec) or the design flux (if known) during the post-disposal phase.

Section 4.4 presents the doses and risks calculated by the current risk assessment, and Section 4.5summarizes them. Additional information on the current risk assessment appears in SC&A 2011.

5.2 Uranium Recovery Source Categories

The preceding items and key issues are the basis for categorizing the major uranium recovery methods that will lead to methods of reducing radon emissions. The next section, which addresses the GACT standard, further discusses the applicability of the control measures. The following source categories represent a logical breakdown of the current uranium recovery industry:

Conventional Impoundments – Conventional impoundments are engineered structures for storage and eventual permanent disposal of the fine-grained waste from mining and milling operations (i.e., tailings). All conventional uranium recovery mills have one or more conventional impoundments. Table 3 shows conventional uranium milling facilities that are either built or licensed. This category will also include future conventional milling facilities.

Nonconventional Impoundments – At nonconventional tailings impoundments, tailings (byproduct material) are contained in ponds and covered by liquids. These impoundments are normally called “evaporation ponds” or “holding ponds.” Nonetheless, they contain byproduct material and, as shown in Section 3.3.1, can generate radon gas. This category is usually associated with ISL facilities (i.e., process waste water resulting from ISL operations (see Section 3.3)), but can also be associated with conventional facilities or heap leach facilities. While these ponds do not meet the work practices for conventional mills, they still must meet the requirements of 40 CFR 192.32(a)(1).

Heap Leach Piles – While no heap leach facilities are currently operating in the United States, at least one potential operation is expected to go forward (see Section 3.4). Heap leach piles contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct. As stated above, the design and operation of the heap leach is expected to follow the requirements of 40 CFR 192.32(a)(1).

5.3 The GACT Standard

Section 112(d) of the CAA requires EPA to establish NESHAPs for both major and area sources of HAPs that are listed for regulation under CAA section 112(c). Section 112(c) lists

radionuclides, including radon, as a HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for regulation of emissions of HAP. A "major source," other than for radionuclides, is defined as any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, in the aggregate, 10 tons per year or more of any HAP. For radionuclides, major source shall have the meaning specified by the Administrator by rule. An area source is a stationary source that is not a major source.

The regulation of HAPs at major sources is dictated by the use of MACT. Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating a MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

In 2000, EPA provided guidance to clarify how to apply the major source threshold for HAPs as defined in section 112(b) of the CAA Amendments of 1990. The guidance stated how to apply the major source threshold specifically for radionuclides:

> *There have been some questions about determining the major source threshold for sources of radionuclides. Section 112(a)(1) allows the Administrator to establish different criteria for determining what constitutes a major source of radionuclides since radionuclides emissions are not measured in units of tons. This, however, would not preclude a known radionuclide emitter that is collocated with other HAP-emitting activities at a plant site from being considered a major source due to the more common, weight-based threshold. The July 16, 1992, source category list notice did not include any sources of radionuclides because no source met the weight-based major source threshold, and the Agency had not defined different criteria. At the current time, there remain no listed major source categories of radionuclide emissions.* [EPA 2000b]

Based on this guidance, radon emissions from uranium recovery facility tailings impoundments are not a major source, and therefore, they are area sources for which the GACT standard is applicable. Unlike MACT, the meaning of GACT, or what is "generally available" is not defined in the act. However, section 112(d)(5) of the CAA Amendments for 1990 authorizes EPA to:

> *Promulgate standards or requirements applicable to [area] sources…which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.*

The Senate report on the legislation (U.S. Senate 1989) provides additional information on GACT and describes it as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic*

> *impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.*

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. Also considered are the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are also reviewed to determine whether such technologies and practices can be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

Thus, as presented above, "Promulgate standards or requirements … " does not limit EPA to strict "standard setting" in order to provide for the use of GACT. Rather, it allows EPA to promulgate at least two types of rules: rules that set emission levels based on specific controls or management practices (this is analogous to the MACT standard setting), and rules that establish permitting or other regulatory processes that result in the identification and application of GACT standards.

5.4 Uranium Recovery Categories and GACT

For conventional impoundments, the 1989 promulgation of Subpart W contained two work practice standards, phased disposal and continuous disposal (see Section 2.0, page 7). The work practice standards limit the size and number of the impoundments at a uranium recovery facility in order to limit radon emissions. The standards cannot be applied to a single pile that is larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). This approach was taken in recognition that the radon emissions from these impoundments could be greater if the piles were left dry and uncovered. The 1989 Subpart W also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for preventing and mitigating ground water contamination.

As discussed earlier, it is no longer believed that a distinction needs to be made for conventional impoundments based on the date when they were design and/or constructed. The existing impoundments at both the Shootaring Canyon (Section 3.2.3) and Sweetwater (Section 3.2.1) facilities can meet the work practice standards in the current Subpart W regulation. Impoundments at both these facilities have an area of less than 40 acres and are synthetically lined as required in 40 CFR 192.32(a). Also, the existing Cell 3 at the White Mesa mill will be closed in 2012 and replaced with impoundments that meet the phased disposal work practice standard (Section 3.2.2). Therefore, there is no reason not to apply the work practice standards required for impoundments designed or constructed after December 15, 1989, to these older impoundments. By incorporating these impoundments under the work practice standards, the requirement of radon flux testing is no longer needed and will be eliminated.

For the proposed GACT, the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards were evaluated. Liner requirements in use for the permitting of hazardous waste land disposal units under RCRA are contained in 40 CFR 264.221. Since 40 CFR 192.32(a)(1) references 40 CFR 264.221, it is the only requirement necessary for Subpart W, as the RCRA requirements are effective methods of containing tailings and protecting ground water while also limiting radon emissions. The regulation in 40 CFR 264.221 contains safeguards to allow for the placement of tailings and also provides for an early warning system in the event of a leak in the liner system. Therefore, the proposed GACT for conventional impoundments retains the two work practice standards and the requirements of 40 CFR 192.32(a)(1), because they have proven to be effective methods for limiting radon emissions while also protecting ground water. The NRC considers the requirements of 40 CFR 192.32(a) in its review during the licensing process.

For nonconventional impoundments, where tailings (byproduct material) are contained in ponds and covered by liquids, a new GACT is proposed. These facilities, called "evaporation ponds" or "holding ponds," also must meet the requirements of 40 CFR 192.32(a)(1). Specifically, these are the design and operating requirements for the impoundments. Because of the general experience that a depth of greater than 1 meter of liquid essentially reduces the radon flux of ponds to negligible levels, no monitoring is required for this type of impoundment. Given these factors, the following GACT is proposed:

> Nonconventional impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

For the last category, heap leach piles, an approach similar to that for nonconventional impoundments is proposed. As previously noted, these facilities contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct material, which is regulated under Subpart W. As for nonconventional impoundments, the design and operation of the heap leach pile is expected to follow the requirements of 40 CFR 192.32(a)(1). This also will prevent the loss of pregnant liquor (lixiviant with dissolved uranium) from spillage or leakage.

The byproduct material that makes up the volume of the spent heap leach pile is typically wet. As Figure 15 shows, as material goes from dry to wet the radon flux first increases before it decreases (the reasons for this are discussed in Section 5.1.5). While it is impossible to maintain a completely wet state, it is possible to maintain a sufficient percentage of moisture content to meet a goal that the radon flux in the wetted material is below what the flux would be if the material was dry. This percentage is related to the state or material being "dewatered." By way of definition, 40 CFR 61.251(c) states:

> Dewatered *means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight*.

Thus, the proposed GACT for heap leach piles is that, in addition to meeting 40 CFR 192.32(a)(1), operating heap leach piles must maintain a moisture content greater than

30% (equivalent to about 70% to 80% moisture saturation, as described in Section 5.1.5). This would, as indicated, ensure that the radon flux from the surface of the pile is quite low, i.e., at or below what the flux would be if the material in the pile was dry.

Since the purpose of this GACT is to control the radon emissions, it may not be critical to maintain the 30% moisture content in the lower levels/lifts of the pile. The reason for this is two-fold; first, radon generated in the lower levels would have to travel further in the pile before it would escape to the atmosphere, thereby giving it more time to decay within the pile, and second, radon from the lower layers will be slowed due to the 30% moisture content in the upper levels. Additionally, if inter-lift liners are provided when the pile is composed of multiple lifts, the inter-lift liner would act as a barrier to radon from the lower lifts, and thus mitigate the need for those lower lifts to maintain the 30% moisture content. On the other hand, because radon emission do not stop when active uranium leaching has ceased, it will be necessary to continue wetting the pile to maintain the 30% moisture content until a final reclamation cover (including a radon barrier layer) has been constructed over the pile.

5.5 Other Issues

During the review of Subpart W, several additional issues were identified. These are identified and discussed in this section.

5.5.1 Extending Monitoring Requirements

In reviewing Subpart W, EPA examined whether radon monitoring should be extended to all impoundments constructed and operated since 1989 so that the monitoring requirement would apply to all impoundments containing uranium byproduct material (i.e., tailings). EPA also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. As the rule currently exists, only pre-1989 conventional tailings impoundments are required to monitor for radon emissions, the requirement being an average flux rate of not more than 20 pCi/(m^2-sec). This is because, at the time of promulgation of the 1989 rule, EPA stated that the proposed work practice standards would be effective in reducing radon emissions from operating impoundments. Since the work practice standards could not be applied to pre-1989 facilities, and since EPA determined that it is not feasible to prescribe an emissions standard for radon emissions from a tailings impoundment (54 FR 9644 (FR 1989a)), the improved work practice standards would limit radon emissions by limiting the amount of tailings exposed.

Thus, it is not necessary to require radon monitoring at facilities constructed after the current Subpart W was promulgated (i.e., December 15, 1989). With respect to tailings and the amount of water used to cover them, the work practice standards (now proposed as GACTs) are also protective in preventing excess radon emissions. Further, for nonconventional impoundments, where there is no applicable radon monitoring method, the standing liquid requirement will effectively prevent all radon emissions from holding or evaporation ponds.

5.5.2 Clarification of the Term "Operation"

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement [which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W]. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

> <u>Operation.</u> Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

5.5.3 Clarification of the Term "Standby"

In the past, there has been confusion as to whether the requirements of Subpart W apply to a uranium recovery facility that is in "standby" mode. Although not formally defined in Subpart W, "standby" is commonly taken to be the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations. This period usually takes place when the price of uranium is such that it may not be cost effective for the facility to continue operations, and yet the facility fully intends to operate once the price of uranium rises to a point where it is cost effective for the facility to re-establish operations. As shown in Table 3, the Sweetwater and Shootaring Canyon mills are currently in standby. While in standby, a uranium recovery facility can change its license from an operating license to a possession only license, thereby reducing its regulatory obligations (and costs).

The addition of the following definition of "closure" into the Subpart W definitions at 40 CFR 61.251 would eliminate confusion:

> <u>Standby</u>. Standby means the period of time that a facility may not be accepting new tailings, but has not yet entered closure operations.

5.5.4 The Role of Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these western regions, the annual average precipitation (see Figure 16) falling on the impoundment is less than the annual average evaporation (see Figure 17) from the impoundment. Also, these facilities are located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. However, recent uranium exploration in the United States shows the potential to move eastward, into more climatologically temperate regions of the country. South central Virginia is now being considered for a conventional uranium mill (e.g., the Coles Hills, see Table 4). To determine whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

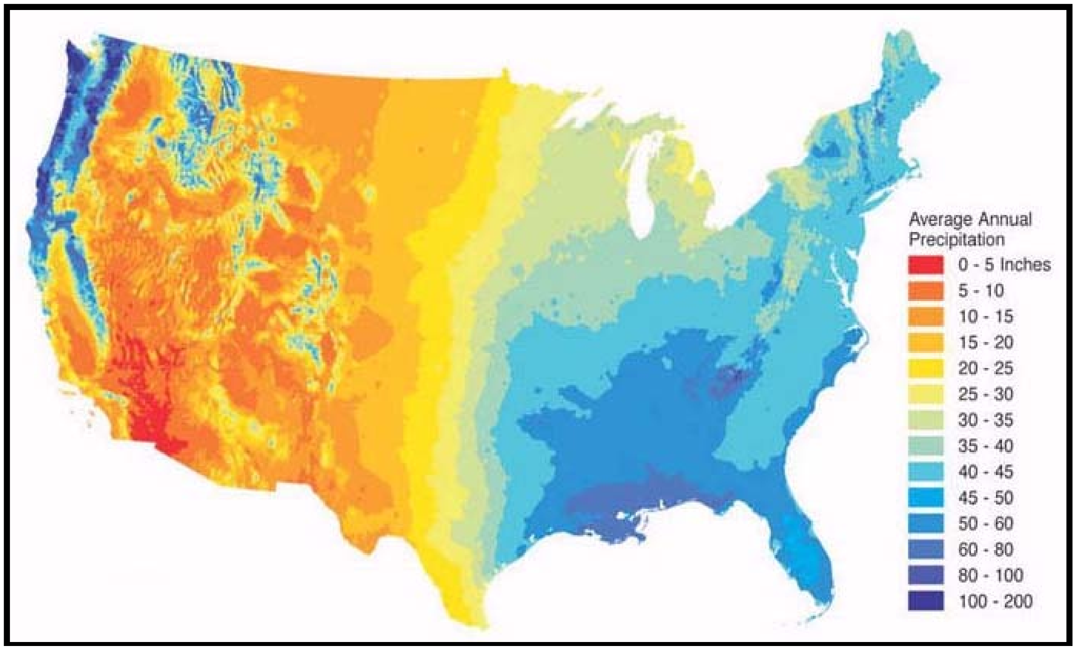


Figure 16: U.S. Average Annual Precipitation

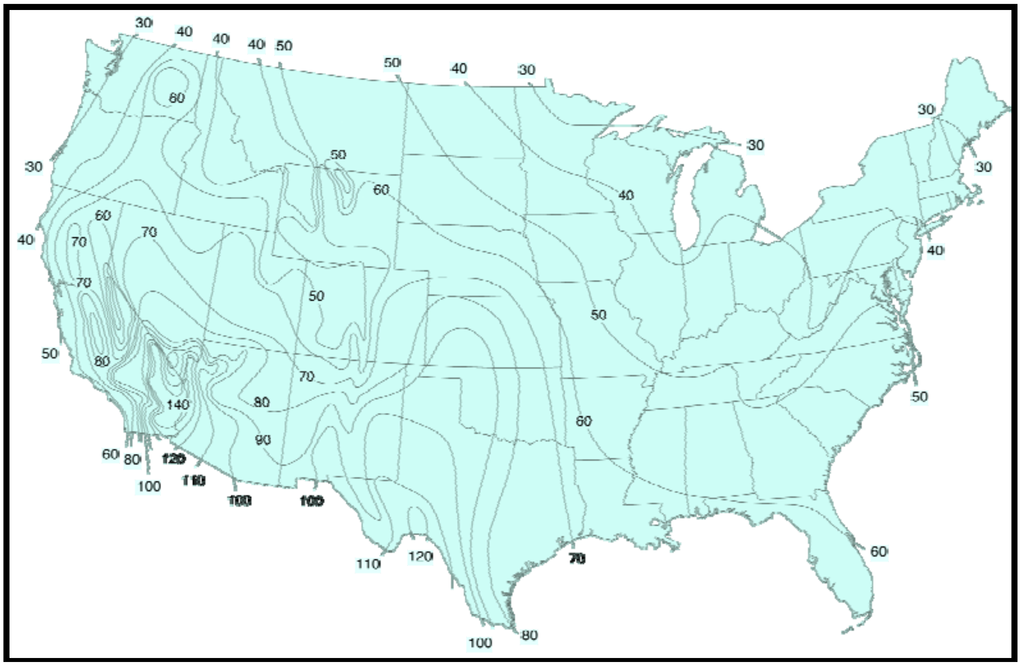


Figure 17: U.S. Mean Annual Evaporation

Subpart W requires owners and operators of uranium tailings impoundments to follow the requirements of 40 CFR 192.32(a). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that can be used to ensure proper operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action; rainfall; run-on; malfunctions of level controllers, alarms and other equipment; or human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive dike failure. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Uranium recovery facilities are already operating under the requirements of 40 CFR 192.32(a)(1), including compliance with 40 CFR 264.221(g) and (h), which will provide protection against the weather events likely to occur in the eastern United States.

6.0 ECONOMIC IMPACTS ASSOCIATED WITH REVISION/MODIFICATION OF THE SUBPART W STANDARD

This section contains the following economic impact analyses necessary to support any potential revision of the Subpart W NESHAP:

- Section 6.1 provides a review and summary of the original 1989 economic assessment and supporting documents.
- The baseline economic costs for development of new conventional mills and ISL and

heap leach facilities are developed and presented in Section 6.2.

- Section 6.3 presents the anticipated industry costs versus environmental and public health benefits to be derived from each of the four proposed GACT standards.

- Finally, Section 6.4 provides demographic data regarding the racial and socioeconomic composition of the populations surrounding uranium recovery facilities.

To assess the economic impacts of potential revisions to the Subpart W NESHAP, capital costs (including equipment costs), labor costs, taxes, etc., were obtained from actual recent cost estimates that have been prepared for companies planning to design, develop, construct, and operate uranium recovery facilities. For ISL facilities, two recent cost estimates were used as the basis for this analysis, while for conventional mills and heap leach facilities, a single cost estimate was used for each type of facility. Other necessary data, such as a discount rate, borrowing, and interest rates, were assumed, as described in Section 6.2.

Where feasible and appropriate, the economic models and recommendations from EPA's "Guidelines for Preparing Economic Analyses" (EPA 2010) were followed in assessing these economic impacts.

The cost and economic impact estimates described in Section 6.2 and 6.3 are based on industry data compiled in 2010-2011. Therefore, some of the analytical input values would differ somewhat if they were updated to reflect the latest information available. For example, the current long-term market price of uranium is approximately 17 percent lower than the $65 estimate that is used in the analysis (Cameco, 2013). The uranium mining industry is currently experiencing a volatile period resulting from the aftereffects of the Fukushima nuclear disaster. In particular, uranium demand has suffered from nearly all of Japan's workable reactors remaining offline since the March 2011 earthquake and tsunami triggered multiple meltdowns at the Fukushima Dai-ichi plant. Given the atypical post-Fukushima uranium market situation of the last couple of years and the prospects for a return to more normal market activity in the mid-term future,[7] we have decided not to update the analysis to incorporate the latest industry data. The results of the analyses described in this section are judged to be realistic estimates of the mid- to long-term impacts of the proposed Subpart W NESHAP.

6.1 1989 Economic Assessment

When Subpart W was promulgated in 1989, EPA performed both an analysis of the standard's benefits and cost and an evaluation of its economic impacts. Those analyses appear in the 1989 BID, Volume 3, Sections 4.4 and 4.5 (EPA 1989). This section briefly summarizes the Subpart W economic assessments performed in 1989.

[7]These prospects include: the conclusion of the U.S.-Russia program that annually removes 24 million pounds of ex-military highly enriched uranium from the market via down-blending for use as U.S. nuclear fuel; the 60 nuclear power plants that are currently under construction throughout the world; efforts to reduce climate change emissions; and expectations that Japan will slowly begin restarting its 50 nuclear plants.

In these 1989 assessments, EPA evaluated the benefits and costs associated with three separate decisions. The first decision concerned a limit on allowable radon emissions after closure. The options evaluated included reducing radon emissions from the 20 pCi/(m^2-sec) limit to 6 pCi/(m^2-sec) and 2 pCi/(m^2-sec).

The second decision that EPA investigated was the means by which the emissions from active mills could be reduced to the 20 pCi/(m^2-sec) limit while operations continue. Emissions could be reduced by applying earth and water covers to portions of the dry areas of the tailings piles, which could reduce average radon emissions for the entire site to the 20 pCi/(m^2-sec) limit.

While the first two decisions were focused on tailings piles that existed at the time the standard was promulgated, the third concerned future tailings impoundments. EPA evaluated alternative work practices for the control of radon emissions from operating mills in the future. Options investigated include the replacement of the traditional single-cell impoundment (i.e., the 1989 baseline) with phased disposal or continuous disposal impoundments.

6.1.1 Reducing Post-Closure Radon Emissions from 20 pCi/(m^2-sec)

The 1989 BID estimated the total annual tailings piles radon emissions for standards of 20, 6, and 2 pCi/(m^2-sec) and calculated the cancers that could result from those emissions. It found that over a 100-year analysis period, the 6 pCi/(m^2-sec) option could lower local and regional risks by 3.6 cancers, while the incremental benefit of lowering the allowable flux rate from 6 to 2 pCi/(m^2-sec) was estimated at 1.0 cancer.

The increased costs associated with reducing the allowable flux rate from 20 to 6 pCi/(m^2-sec) were estimated to be between $113 and $180 million (1988$) ($205 and $327 million (2011$)), while attainment of a 2 pCi/(m^2-sec) flux rate was estimated to result in added costs of $216 to $345 million (1988$) ($393 to $627 million (2011$)).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. As the following excerpt from the preamble to the standard shows, for tailings piles at operating mills, EPA's decision was based on the very low risks associated with 20 pCi/(m^2-sec), rather than on a comparison of the benefits versus the costs of the alternative emission standards:

> *… the risks from current emissions are very low. A NESHAP requiring that emissions from operating mill tailings piles limit their emissions to no more than 20 pCi/(m^2-sec) represents current emissions. EPA has determined that the risks are low enough that it is unnecessary to reduce the already low risks from the tailings piles further.* [FR 1989a, page 51680]

While for tailings impoundments at inactive mills, the preamble presented a quantitative cost-benefit comparison as justification for maintaining the radon emission level at 20 pCi/(m^2-sec):

> *EPA examined these small reductions in incidence and maximum individual risk and the relatively large costs of achieving Alternative II* [6 pCi/(m^2-s)]*, $158 million capital coat and $33 million in annualized costs and determined that Alternative I* [20 pCi/(m^2-s)] *protects public health with an ample margin of safety.* [FR 1989a, page 51682]

6.1.2 Reducing Radon Emissions During Operation of Existing Mills

The 1989 BID estimated the reduction in total risk that could be obtained by reducing radon emissions from active mills operating at that time to 20 pCi/(m^2-sec) through the application of an earthen cover and/or by keeping the tailings wet. The 1989 BID, Table 4-41, reported the risk reduction to be 0.17 fatal cancers for all active mills over their assumed 15-year operational life.

The 1989 BID, Table 4-42B, reported that the cost for providing the earthen covers and for keeping the tailings wet over the 15-year operating period was estimated to be $13.166 million (1988$) ($23.94 million in 2011$).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. EPA nonetheless decided that without these standards the risks were too high, as the following segment from the preamble to the standard indicates:

> *… EPA recognizes that the risks from mill tailings piles can increase dramatically if they are allowed to dry and remain uncovered. An example of how high the risks can rise if the piles are dry and uncovered can be seen in the proposed rule, 54 FR 9645. That analysis assumed that the piles were dry and uncovered and the risks were as high as 3×10^{-2} with 1.6 fatal cancers per year. Therefore, EPA is promulgating a standard that will limit radon emissions to an average of 20 pCi/m^2-s. This rule will have the practical effect of requiring the mill operators to keep their piles wet or covered. …* [FR 1989a, page 51680]

6.1.3 Promulgating a Work Practice Standard for Future Tailings Impoundments

Section 4.4.3.1 of the 1989 BID provides the following explanations of the phased and continuous disposal options:

> ***Phased Disposal***
>
> *The first alternative work practice which is evaluated for model new tailings impoundments is phased disposal. In phased or multiple cell disposal, the tailings impoundment area is partitioned into cells which are used independently of other cells. After a cell has been filled, it can be dewatered and covered, and another cell used. Tailings are pumped to one initial cell until it is full. Tailings are then pumped to a newly constructed second cell and the former cell is dewatered and then left to dry. After the first cell dries, it is covered with earth obtained from the construction of a third cell. This process is continued sequentially. This system*

minimizes emissions at any given time since a cell can be covered after use without interfering with operations as opposed to the case of a single cell.

Phased disposal is effective in reducing radon-222 emissions since tailings are initially covered with water and finally with earth. Only during a drying-out period of about 5 years for each cell are there any [significant] *radon-222 emissions from the relatively small area. During mill standby periods, a water cover could be maintained on the operational cell. For extended standby periods, the cell could be dewatered and a dirt cover applied.*

Continuous Disposal

The second alternative work practice, continuous disposal, is based on the fact that water can be removed from the tailings slurry prior to disposal. The relatively dry dewatered (25 to 30% moisture [by weight]*) tailings can then be dumped and covered with soil almost immediately. No extended drying phase is required, and therefore very little additional work would be required during final closure. Additionally, ground water problems are minimized.*

To implement a dewatering system would introduce complications in terms of planning, design, and modification of current designs. Acid-based leaching processes do not generally recycle water, and additional holding ponds with ancillary piping and pumping systems would be required to handle the liquid removed from the tailings. Using trucks or conveyor systems to transport the tailings to disposal areas might also be more costly than slurry pumping. Thus, although tailings are more easily managed after dewatering, this practice would have to be carefully considered on a site-specific basis.

Various filtering systems such as rotary vacuum and belt filters are available and could be adapted to a tailings dewatering system. Experimental studies would probably be required for a specific ore to determine the filter media and dewatering properties of the sand and slime fractions. Modifications to the typical mill ore grinding circuit may be required to allow efficient dewatering and to prevent filter plugging or blinding. Corrosion-resistant materials would be required in any tailings dewatering system due to the highly corrosive solutions which must be handled. …

The committed fatal cancer risk[8] from the operation of model baseline (single-cell), phased disposal, and continuous disposal impoundments, as determined by the 1989 BID, is shown in Table 17. Table 17 shows the following:

[during] *the operational period the risk of cancer is reduced, relative to the single cell baseline, by 0.129 if phased disposal is adopted and by 0.195 if the continuous single cell method is used. The risk reduction associated with using the continuous single cell relative to the phased approach is 0.066. In the post-operational phase, phased disposal raises the risk by 0.012 relative to the*

[8] "Committed fatal cancer risk" is the likeliness that an individual will develop and die from cancer at some time in the future due to their current exposure to radiation. "Committed fatal cancer risk" is sometimes referred to as "latent cancer fatality risk."

baseline, while the continuous single cell approach lowers it by 0.017 relative to the baseline and by 0.028 relative to phased disposal. [EPA 1989, Section 4.4.3.3]

Table 17: Radon Risk Resulting from Alternative Work Practices (Committed Cancers)

	Baseline (Single Cell)	Phased Disposal	Continuous Disposal
Operational Period (0 to 20 years)	0.282	0.153	0.087
Post-Operations (21 to 100 years)	0.264	0.276	0.247
Total	0.546	0.429	0.334

Source: EPA 1989, Table 4-45

Concerning the cost to implement the work practices, the 1989 BID indicates the following:

the phased … disposal impoundment is the most expensive design ($54.02 million [1988$]*), while the single cell … impoundment ($36.55 million* [1988$]*) is the least expensive. Costs for the continuous single cell design ($40.82 million* [1988$]*) are only slightly more than those of the single cell impoundment, although the uncertainties surrounding the technology used in this design are the largest*. [EPA 1989, Section 4.4.3.4]

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. However, as the following excerpt from the preamble to the standard shows, EPA was concerned about the uncertainty of the benefits and costs analysis that had been performed for this portion of the regulation. Ultimately, the Agency based its decision on the small cost to implement the work practices, rather than on weighing the benefits versus the costs:

The uncertainty arises because it assumes a steady state industry over time. If the uranium market once again booms there would be increased risks associated with Alternative I [one large impoundment (i.e., baseline)]. *If the industry then experienced another economic downturn, the costs of Alternative I would increase because of the economic waste that occurs when a large impoundment is constructed and not filled. The risks can also increase if a company goes bankrupt and cannot afford the increased costs of closing a large impoundment and the pile sits uncovered emitting radon. The risks can also increase if many new piles are constructed, creating the potential for the population and individual risks to be higher than EPA has calculated.*

These uncertainties significantly affect the accuracy of the [benefits and costs] *analysis and given the small cost of going to Alternatives II* [phased disposal] *and III* [continuous disposal]*, EPA has determined that in order to protect the public*

with an ample margin of safety, both now and in the future, new mill tailings impoundments must use phased or continuous disposal. [FR 1989a, page 51680]

6.1.4 Economic Impacts

To determine the economic impacts of the proposed Subpart W on the uranium production industry, the 1989 BID evaluated two extreme cases; in the first, it was assumed that "no portion of the cost of the regulation can be passed on to the purchaser of U_3O_8," and in the second, it was "assumed that the uranium production industry is able to recover the entire increase in the tailings disposal cost by charging higher U_3O_8 prices." These two cases provided the lower and upper bound, respectively, of the likely economic impacts of Subpart W on the uranium production industry.

As described in Section 3.1, from 1982 to 1986, the uranium production industry had been contracting and experiencing substantial losses because of excess production capacity. The 1989 Subpart W economic impact assessment concluded that if the industry had to absorb the costs of implementing the regulation, the present value cost at that time would be about five times the industry losses from 1982 to 1986, or equal to about 10% of the book value of industry assets at that time, or about 15% of industry's liabilities.

Alternatively, if the uranium production industry could pass on the Subpart W implementation costs to its electric power industry customers, who would likely pass on the costs to the electricity users, the 1989 economic impact assessment concluded:

> *The revenue earned by the* [electric power] *industry for generating 2.4 trillion kilowatt hours of electricity in 1986 was 121.40 billion dollars. The 1987 present value of the regulation (estimated to be $250 million) is less than 1 percent (.06%) of the U.S. total electric power revenue for the same year.* [EPA 1989, Section 4.5.1]

The 1989 BID drew no conclusions regarding what effects, if any, these impacts would have on the uranium production industry's financial health.

6.2 U_3O_8 Recovery Baseline Economics

This section presents the baseline economics for development of new conventional mills, ISL facilities, and heap leach facilities. EPA's economic assessment guidelines define the baseline economics as "a reference point that reflects the world without the proposed [or in the case of Subpart W, the modified] regulation. It is the starting point for conducting an economic analysis of potential benefits and costs of a proposed [or modified] regulation" (EPA 2010, Section 5).

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the conventional mill, data from the proposed new mill at the Piñon Ridge project in Colorado were used. For the ISL facility, data from two proposed new facilities were used: the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production

period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Sections 6.2.1 through 6.2.4 provide details of how the project-specific cost data were converted into base case economic data, and Section 6.2.5 presents a short sensitivity study for the conventional mill and heap leach cost estimates. Because two projects were analyzed, a sensitivity analysis of the ISL cost estimates was not performed.

Next it was necessary to estimate the annual amount of U_3O_8 that is currently used and how much would be required in the future. For these estimates, data from the Energy Information Administration (EIA) were used. Section 6.2.6 describes how the EIA data were coupled with specific cost data for the uranium recovery facilities to determine the cost and revenue estimates provided in Table 18.

Table 18: Uranium Recovery Baseline Economics (Nondiscounted)

Cost / Revenue	2009 ($1,000)		2035 Projections ($1,000)*			
	2009$	2011$	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$347,000	$462,000	$502,000	$473,000	$605,000	$706,000
U_3O_8 Cost	$298,000	$372,000				
Conventional			$398,000	$375,000	$480,000	$560,000
In-Situ Leach			$396,000	$373,000	$477,000	$557,000
Heap Leach			$356,000	$335,000	$429,000	$501,000
Mixed Facilities			$392,000	$368,000	$472,000	$553,000

* See the discussion below and in Section 6.2.6 for a description of these cases.

Table 18 presents uranium production industry cost and revenue for six cases. The first two cases are based on the actual amount of U_3O_8 produced in the United States in 2009 (the last year for which data are available). The two 2009 cases differ in that the first is based on 2009 dollars, including the weighted-average price of $48.92 per pound for uranium of U.S. origin, while the second was based on assumptions used in this analysis (i.e., 2011 dollars and a U_3O_8 price of $65 per pound). The remaining four cases in Table 26 are all based on the assumptions used in this analysis, but differ in the amount of U_3O_8 assumed to be produced in the United States in 2035. The first through third 2035 cases are for the Reference, Low Nuclear Production, and High Nuclear Production projected 2035 nuclear power usage, as estimated by the EIA (see Section 6.2.6). It should be noted that most of the U_3O_8 used in the United States is from foreign suppliers. The fourth 2035 case (Ref Low Import) increases the percentage of U.S.-origin uranium to 20% for the reference nuclear power usage estimate.

For each of the four 2035 projection cases, four assumptions were made regarding the source of the U_3O_8: (1) all U_3O_8 is from conventional mills, (2) all U_3O_8 is from ISL (recovery) facilities, (3) all U_3O_8 is from heap leach facilities, and (4) the U_3O_8 is from a mixture of uranium recovery facilities (see Section 6.2.6, page 87, for a definition of the mixture). Table 19 shows that the type of uranium recovery facility assumed makes only about a 15% difference between the lowest cost (heap leach) and the largest cost (ISL) recovery type facility.

6.2.1 Conventional Mill Cost Estimate

The base case economic costs for development of a new conventional mill were developed using data from the proposed new mill at Piñon Ridge in Colorado (Edge 2009). Although cost estimates for other conventional mills were reviewed, e.g., Coles Hill (Lyntek 2010), Church Rock (BDC 2011), the Piñon Ridge cost estimate was selected for the base case because it is believed to be the furthest advanced. Specific cost data obtained from the Piñon Ridge project (i.e., Edge 2009, Tables 7.1-1 and 7.1-2) were for land acquisition and facility construction, operating and maintenance, decommissioning, and regulatory oversight. While the Piñon Ridge project supplied the mill design parameters and the overall magnitude of the cost, additional data on the breakdown of the capital and operating costs were taken from the Coles Hill uranium project located in Virginia (Lyntek 2010).

Assumptions used to develop the conventional mill base case cost estimate include:

- As per the Piñon Ridge project, the mill design processing capacity is1,000 tons per day (tpd), and the licensed operating processing rate is 500 tpd.

- The operating duration is 40 years, as per the Piñon Ridge project.

- Because they were more detailed, the Coles Hill cost data (Lyntek 2010) were used to generate a percentage breakdown of the Piñon Ridge cost estimates (Edge 2009). For example, the Piñon Ridge operating cost estimate was divided into labor, power and water, spare parts, office and lab supplies, yellowcake transportation, tailings operating, and general and administration (G&A) using Coles Hill percentages. Thus, the Coles Hill data affected the detailed breakdown of the cost estimate, but not its magnitude.

- Ore grades are 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The base case analysis did not use the Piñon Ridge project's average ore grade of 0.23%.

- The U_3O_8 recovery rate is 96% per the Piñon Ridge project.

- A line of credit (LoC) of $146 million has an annual interest rate of 4%, with a 20-year payback period.

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

The Piñon Ridge project data do not include the costs to develop and/or operate a uranium mine. Rather, it is assumed that these costs are included in the cost of the uranium ore purchased for processing at the Piñon Ridge mill. Mine development and operating costs are included for the conventional mill based on an average of the open pit and underground mine costs developed for the heap leach facility (see Section 6.2.2).

Table 19 presents the cost estimates that were developed for the conventional uranium mill.

Table 19: Conventional Mill Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)	7,000	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	15,958	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$1,037,299	$617,406	$369,925
Line of Credit (LoC)	$146,000	$154,891	$167,155
Mine Costs			
Development	$82,553	$49,136	$29,440
Operating	$261,195	$155,465	$93,148
Mill Costs			
Construction	$134,073	$139,870	$147,761
Mill Direct	$53,136	$55,434	$58,562
Mill Indirect	$9,547	$9,960	$10,522
Mill Contingency	$15,671	$16,348	$17,271
Tailings	$55,718	$58,128	$61,407
Operating and Maintenance	$124,397	$74,042	$44,363
Labor (All inclusive)	$59,267	$35,276	$21,136
Power & Water	$19,400	$11,547	$6,919
Spare Parts	$15,883	$9,454	$5,664
Office and Lab Supplies	$5,117	$3,045	$1,825
Yellowcake Transportation	$2,239	$1,332	$798
Tailings Operating	$22,492	$13,387	$8,021
G&A	$8,634	$5,139	$3,079
Taxes, Claims, and Royalties	$119,289	$71,002	$42,541
Regulatory Oversight	$11,800	$7,191	$4,541
Decommissioning/Closure	$12,000	$3,679	$801
Repay LoC, plus Finance Costs	$214,859	$169,561	$130,302
Total Cost	$968,801	$675,085	$495,978

The cash balance for the conventional mill (as well as the other uranium recovery facilities) is shown in Figure 18. Figure 18 shows that until production year 18, when the LoC has been paid off, the conventional mill is just breaking even.

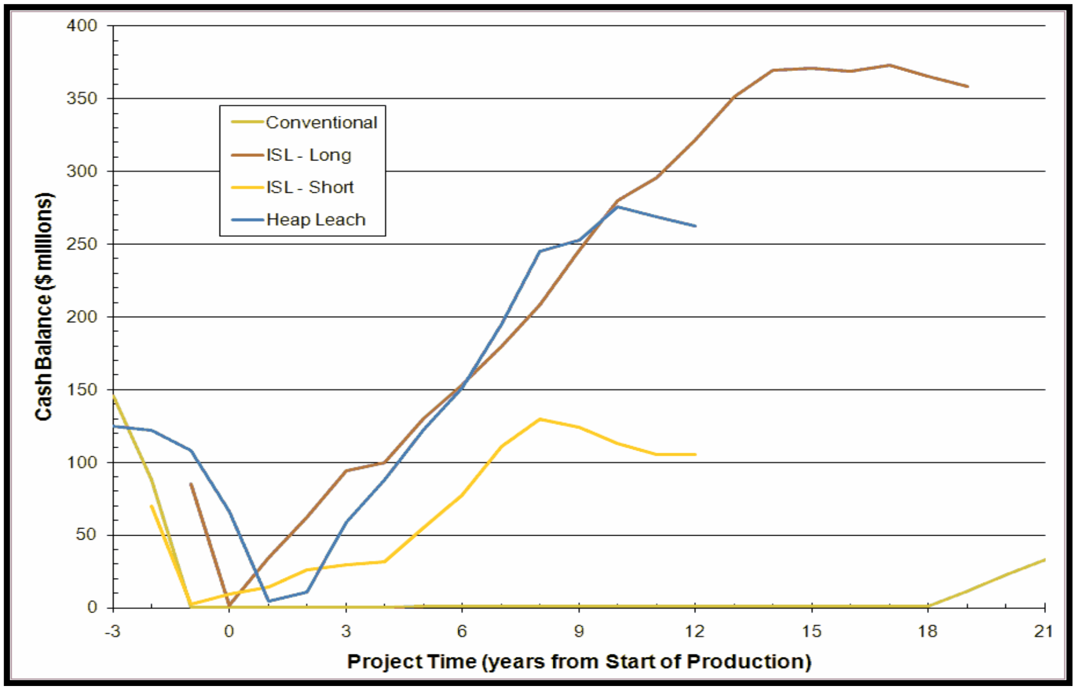


Figure 18: Estimated Cash Balance – Reference Cases

Figure 19 shows the assumed annual U_3O_8 production from the conventional mill (as well as the other uranium recovery facilities). Based on the assumptions used for the base case, the conventional mill produces the least amount of U_3O_8 annually.

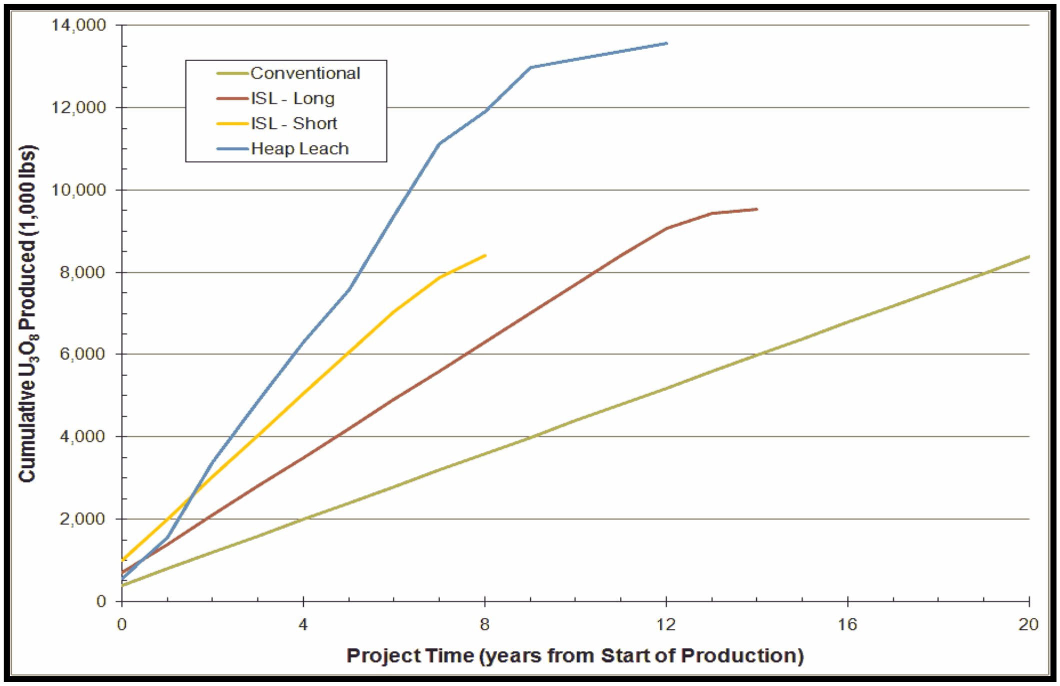


Figure 19: Cumulative U_3O_8 Projections – Reference Cases

6.2.2 Heap Leach Facility Cost Estimate

The base case economic costs for development of a new heap leach facility were developed using data from the proposed new facility at Sheep Mountain in Wyoming (BRS 2011). Specific assumptions used to develop the base case cost estimate for the heap leach facility include:

- The operating duration is 13 years, as per the Sheep Mountain project's uranium production schedule. The annual amount of ore processed averaged 491,758 tons, with maximum and minimum annual processing rates of 916,500 and 74,802 tons, respectively (BRS 2011, page 86).

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the facility capital costs in a manner that would be inconsistent with the estimates provided for the Sheep Mountain project. If additional uranium ore production is to be modeled, a second (or more) and identical heap leach facility should be assumed, either concurrently or sequentially with the first facility.

- Consistent with the Sheep Mountain project cost assumptions, capital investment, totaling $14.177 million, was assumed during the operational period to add more heap leach pads and to replace underground mine equipment. Two additional heap pads were assumed, the first after approximately one-third of the ore is processed, and the second after two-thirds is processed.

- Ore grades were 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The Sheep Mountain project's ore

grades averaged 0.132% for underground and 0.085% for open-pit produced uranium (BRS 2011, page 86).

- The U_3O_8 recovery rate varied between 89% and 92%, depending on the year of operation, as per the Sheep Mountain project (BRS 2011, page 86).
- The cost of open pit mining is $19.28 per ton of ore, while the cost of underground mining is $52.24 per ton, and the cost of heap leach processing is $13.51 per ton (BRS 2011, pages 87 and 88).
- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).
- An LoC of $125 million has an annual interest rate of 4%, with a 15-year payback period.
- Taxes, claims, and royalties total 11.5% of revenue.
- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 20 presents the cost estimates developed for the heap leach facility.

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)			
Open Pit	2,895	N.C.	N.C.
Underground	3,498	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	13,558	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$881,266	$764,878	$643,637
Line of Credit (LoC)	$125,000	$136,591	$153,130
Open Pit Mine			
Capital Costs	$14,590	$14,590	$14,590
Operating Costs	$55,817	$49,594	$42,879
Underground Mine			
Capital Costs	$60,803	$59,880	$58,997
Operating Costs	$182,723	$156,753	$130,078
Heap Pads/Processing Plant			
Capital Costs	$51,885	$50,788	$49,690
Operating Costs	$86,367	$74,973	$63,130

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Shared Costs			
Predevelopment	$10,630	$11,149	$11,874
Reclamation Costs	$17,000	$14,755	$12,416
Taxes, claims, and royalties	$101,346	$87,961	$74,018
Repay LoC/Finance Costs	$168,640	$146,659	$125,441
Total Cost	$749,801	$667,102	$583,114

Figure 18 end of year cash balance for the heap leach facility (as well as for the other uranium recovery facilities). Figure 18 shows that by production year 4, the heap leach facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the heap leach facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the heap leach facility consistently produces the largest quantity of U_3O_8 annually.

6.2.3 In-Situ Leach (Long) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Centennial project in Weld County, Colorado (SRK Consulting 2010b). The Centennial project is expected to have a production period of 14–15 years, which is a long duration for an ISL facility. Annual cost estimates for the Centennial project are provided on pages 117 through 123 of SRK Consulting 2010b. SRK Consulting 2010b, Section 17.11, discusses the basis for the Centennial project cost estimate. Specific assumptions used to develop the ISL (Long) facility base case cost estimate for this analysis include:

- The operating duration is 15 years, as per the Centennial project's uranium production schedule (SRK Consulting 2010b, pages 117 and 120). The facility produces about 700,000 lb of U_3O_8 annually in the first 12 years, then reduces production until only 92,000 lb is produced in the last (15^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Centennial project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Long) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010b, pages 17–24). Funds for restoration are set aside beginning in the second production year and continuing until the end of the project (i.e., year 19 after the start of production).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $85 million has an annual interest rate of 4%, with a 10-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 21 presents the cost estimates that were developed for the ISL (Long) facility.

Table 21: In-Situ Leach (Long) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	9,522	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$618,930	$501,943	$390,820
Line of Credit (LoC)	$85,000	$87,550	$90,950
Operating Cost Summary			
Central Plant/Ponds	$66,536	$52,000	$38,805
Satellite/Well Field	$126,708	$109,218	$90,279
Restoration	$11,257	$8,353	$5,844
Decommissioning	$14,818	$9,175	$5,017
G&A Labor	$16,379	$12,849	$9,732
Corporate Overhead	$6,350	$4,969	$3,761
Contingency	$48,410	$39,313	$30,687
Total Operating Costs	$290,458	$235,877	$184,124
Capital Cost Summary			
CPP/General Facilities	$55,097	$54,027	$52,739
Well Fields	$14,209	$13,868	$13,450
G&A	$13,605	$13,428	$13,212
Mine Closure	$12,585	$7,244	$3,555
Miscellaneous	$14,246	$11,055	$8,202
Contingency	$21,948	$19,924	$18,232
Total Capital Costs	$131,690	$119,546	$109,390
Severance, Royalty, Tax	$71,177	$57,723	$44,944
Repay LoC/Finance Costs	$104,797	$92,076	$78,758
Total Cost	$598,122	$505,223	$417,216

Figure 18 shows the end of year cash balance for the ISL (Long) facility (as well as for the other uranium recovery facilities). Figure 18 shows that by the second year of production, the ISL (Long) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Long) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Long) facility produces an annual

amount of U_3O_8 that is midway between the amounts produced by the conventional mill and heap leach facility.

6.2.4 In-Situ Leach (Short) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Dewey-Burdock project in South Dakota (SRK Consulting 2010a). The Dewey-Burdock project is expected to have a production period of about 9 years, which is representative for an ISL facility. SRK Consulting 2010a, pages 96 through 105, presents annual cost estimates for the Dewey-Burdock project, and Section 17.11 of that report discusses the basis for the Dewey-Burdock project cost estimate. Specific assumptions used to develop the ISL (Short) facility base case cost estimate for this analysis include:

- The operating duration is 9 years, as per the Dewey-Burdock project's uranium production schedule (SRK Consulting 2010a, pages 117 and 120). The facility produces about 1,010,000 lb of U_3O_8 annually in the first 6 years, then production declines until only 533,000 lb is produced in the last (9th) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Dewey-Burdock project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Short) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010a, pages 17–18). Funds for restoration are set aside beginning in the first production year and continuing for 2 years after production ends (i.e., production year 11).

- The price for U_3O_8 is \$65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of \$70 million has an annual interest rate of 4%, with a 5-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 22 presents the cost estimates developed for the ISL (Short) facility.

Table 22: In-Situ Leach (Short) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	8,408	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$546,520	$491,065	$431,098
Line of Credit (LoC)	$70,000	$72,100	$74,900
Operating Cost Summary			
Central Plant/Ponds	$31,036	$27,485	$23,754
Satellite/Well Field	$130,056	$116,074	$100,788
Restoration	$6,159	$5,207	$4,234
Decommissioning	$11,614	$8,594	$5,835
G&A Labor	$9,750	$8,637	$7,500
Corporate Overhead	$3,900	$3,450	$2,994
Contingency	$38,503	$33,889	$29,021
Total Operating Costs	$208,558	$186,696	$162,811
Capital Cost Summary			
CPP/General Facilities	$49,338	$50,297	$51,598
Well Fields	$37,127	$36,951	$36,787
G&A	$2,507	$2,463	$2,414
Mine Closure	$22,460	$16,640	$11,314
Miscellaneous	$9,565	$8,253	$6,927
Contingency	$19,707	$19,593	$19,545
Total Capital Costs	$140,705	$134,197	$128,586
Severance, Royalty, Tax	$83,444	$74,899	$65,698
Repay LoC/Finance Costs	$78,619	$74,171	$68,984
Total Cost	$511,326	$469,963	$426,079

Figure 18 shows the end of year cash balance for the ISL (Short) facility (as well as for the other uranium recovery facilities). Figure 18 shows that in its first year of production, the ISL (Short) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Short) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Short) facility produces an annual amount of U_3O_8 that is midway between the amounts produced by the ISL (Long) and heap leach facilities.

6.2.5 Cost Estimate Sensitivities

The uranium recovery facility base case cost estimates developed in Sections 6.2.1 through 6.2.4 were based on the specific assumptions presented in each section. One of the key parameters for the determination of the conventional mill and heap leach facility cost estimates is the assumed ore grade. Table 23 presents the average ore grades reported by the EIA for U.S.-origin uranium during 2009. These are the ore grades assumed for the conventional mill and heap leach facility cost estimates. As noted in Section 6.2.2, the ore grades assumed in the Sheep Mountain project

cost estimate (BRS 2011) were very similar to the Table 23 values. However, as noted in Section 6.2.1, the Piñon Ridge project cost estimate used an ore grade of 0.23%, which is considerably higher than the Table 23 EIA values (Edge 2009).

Table 23: Uranium Ore Grade		
Mine Type	Ore Output (1,000 tons)	Ore Grade
Underground	76,000	0.142%
Open Pit	54,000	0.086%
In-Situ Leach	145,000	0.08%
Total	275,000	0.10%

Source: EIA 2011b

Table 24 summarizes the cost estimates for all four uranium recovery facilities developed in Sections 6.2.1 through 6.2.4. It includes the heap leach facility and conventional mill sensitivity cost estimates based on the alternate ore grade and ore processing assumptions just described.

Table 24: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC[1]	w/o LoC[2]
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87
Conventional as Designed	$26.57	$25.45
Heap Leach w/ High Grade Ore	$22.13	$20.59

1 Total cost minus LoC revenue divided by the pounds of U_3O_8 produced
2 Total cost minus LoC revenue minus finance charge divided by the pounds of U_3O_8 produced.

The Piñon Ridge mill is being designed to process 1,000 tpd of uranium ore but, because of current market conditions, is currently being licensed to process only 500 tpd. The cost estimate in Section 6.2.1 is based on a conventional mill processing 500 tpd. As an alternative, the conventional mill cost estimate is recalculated using an ore grade of 0.23% and an ore processing rate of 1,000 tpd. These results have been included in Table 24.

So that the facilities maintain a positive cash flow, the analyses in Sections 6.2.1 through 6.2.4 assumed that each facility would be provided with an LoC to cover the construction and development costs. The amount of the LoC was determined by how much cash was necessary to maintain a positive cash balance. The interest on the LoC was assumed to be 4%, and the period to repay the LoC varied for each facility, depending on the amount of the LoC. The interest paid on the LoC is included in the facility cost estimates developed in Sections 6.2.1 through 6.2.4.

The right hand column of Table 24 shows what the facility-specific cost estimates would be without an LoC (and if the cash flow was allowed to be negative), or if the interest rate was 0%.

Figure 20 shows the effect of alternative assumptions on the cash balance.

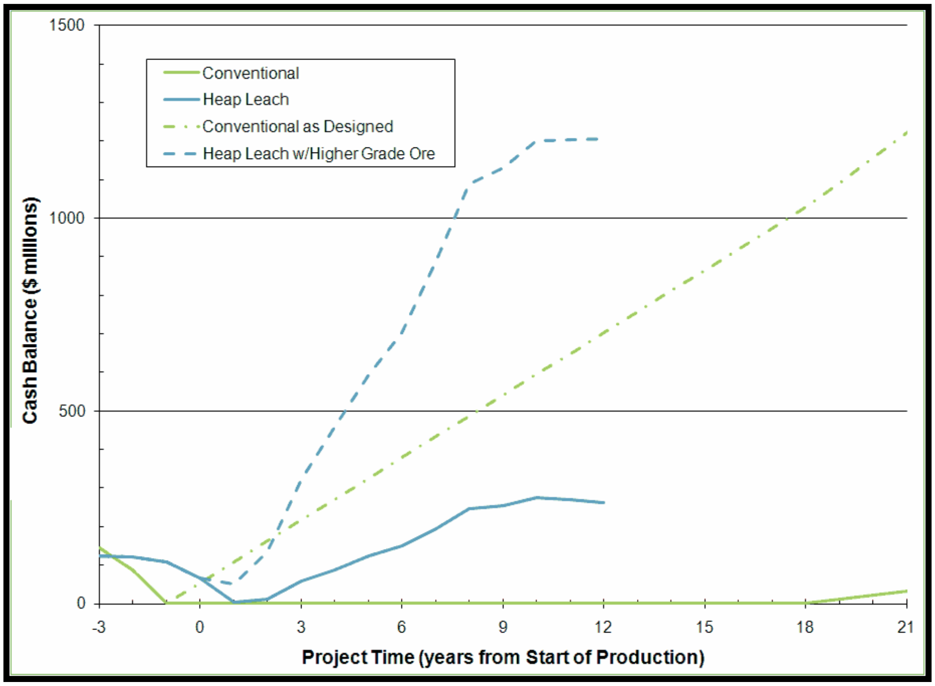


Figure 20: Estimated Cash Balance – Sensitivity Cases

Figure 21 shows the effect of the alternative assumptions on the U_3O_8 production. The obvious conclusion is that the higher the ore grade, the more U_3O_8 is produced, and therefore, the uranium recovery facility is more profitable.

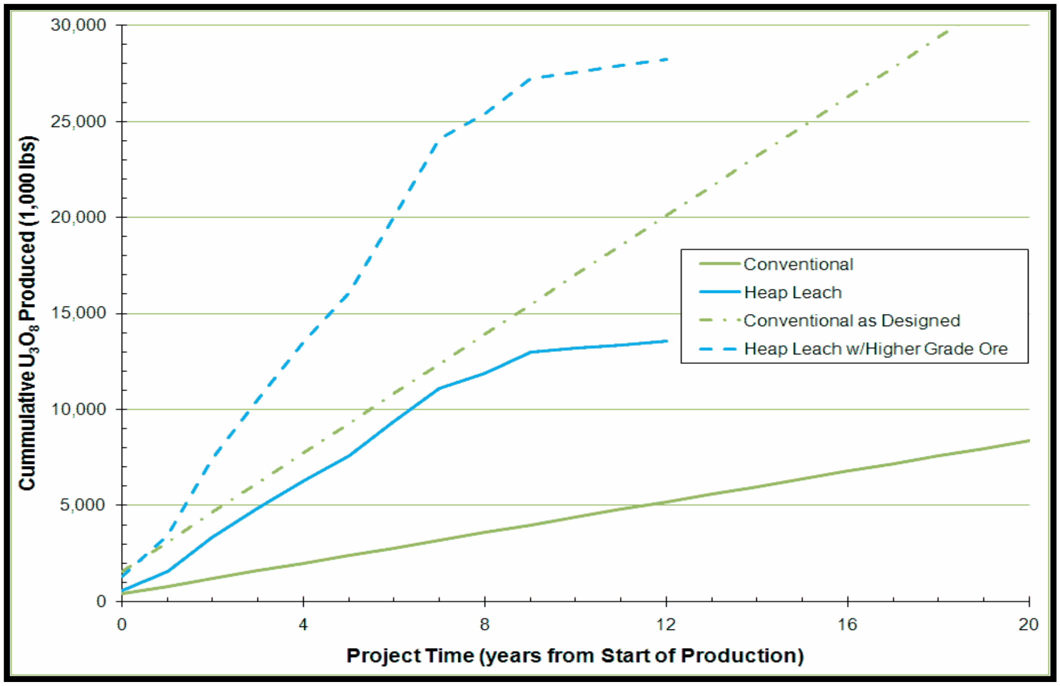


Figure 21: Cumulative U_3O_8 Projections – Sensitivity Cases

6.2.6 Annual Total U_3O_8 Cost Estimates

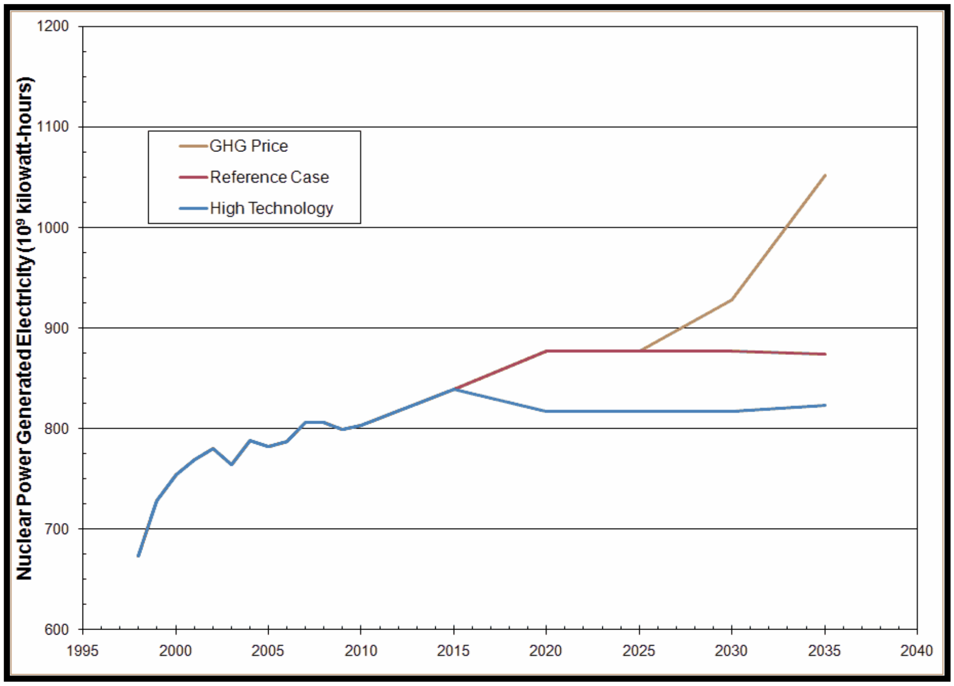
In Sections 6.2.1 through 6.2.4, base case cost estimates were developed for a conventional mill, a heap leach facility, and two ISL facilities. These individual uranium recovery facility cost estimates are used together with the actual 2009 (the last year for which data are available) and projected 2035 U.S.-origin uranium production.

For 2009, the EIA reports that 7,100 thousand pounds of U_3O_8 was produced in the United States (EIA 2011b). For this analysis, the total produced was divided between conventional mills and ISL facilities using the EIA-provided ore outputs, shown in Table 23, which resulted in 3,356,000 lb for conventional mills and 3,744,000 lb for ISL facilities. No heap leach facilities were operating in 2009, so the heap leach production is zero. The 2009 uranium recovery facility total cost and revenue estimates given in Table 18 (page 75) are based on these U_3O_8 production figures and the individual facility unit cost estimates given in Table 24.

These calculated 2009 economic data are based on 2011 dollars (e.g., \$65 per pound of U_3O_8). The 2009 calculated economic data are adjusted to 2009 dollars by assuming an average U_3O_8 price of \$48.92 lb^{-1} (EIA 2010) and adjusting the costs by the ratio of the 2009 energy consumer price index (CPI, 202.301) to the 2011 energy CPI (252.661) (BLS 2011, Table 25). Table 18 (page 75) also gives the 2009 economic data estimates based on 2009 dollars for uranium recovery facilities.

The next part of the analysis was to estimate the future value of the U.S. uranium recovery industry. To this end, it was necessary to estimate the future size of the nuclear power industry. The EIA (2011a) analyzed the U.S. energy outlook for 2011 and beyond, including the contribution from nuclear power. The EIA analyzed a reference case, plus 46 alternative cases,

and determined the nuclear power contribution for each. The EIA reported that in 2010, nuclear power produced 803×10^9 kilowatt-hours of electricity and projected that for the reference case, nuclear power would produce 874×10^9 kilowatt-hours in 2035 (EIA 2011a). Of the 46 alternative cases, the Greenhouse Gas (GHG) Price Economywide and Integrated High Technology cases had the largest and smallest projected nuclear power contributions in 2035, respectively. The GHG Price Economywide case was projected to contribute $1{,}052\times10^9$ kilowatt-hours in 2035, while the Integrated High Technology case was projected to contribute 823×10^9 kilowatt-hours. Figure 22 shows and compares the EIA projections.



Source: EIA 2011a

Figure 22: Nuclear-Generated Electricity Projections

It is assumed that the 2035 to 2009 U_3O_8 requirements would have the same ratio as the 2035 to 2010 EIA (2011a) nuclear power estimates. Thus, for the EIA Reference Nuclear, Low Nuclear Production (Integrated High Technology), and High Nuclear Production (GHG Price Economywide) cases, the total U_3O_8 requirements in 2035 are estimated to be 7,728, 7,277, and 9,302 thousand pounds, respectively. Costs were estimated for four cases, with each case assuming a different type of uranium recovery facility responsible for producing the required U_3O_8. The cases are (1) only conventional mills, (2) only ISL facilities, (3) only heap leach facilities, and (4) a mixture of all three types of facilities.

To divide the total U_3O_8 requirement among the three types of uranium recovery facilities for Case 4, it is assumed that one reference heap leach facility would be operational, and that the remainder of the U_3O_8 would be divided between conventional mills and ISL facilities with the same ratio as in 2009. The total amount of U.S.-origin U_3O_8 for each of the 2035 projections is shown in Table 25 for Case 4. For the remaining three cases, the total 2035 projections given in Table 25 were assumed to be produced by the particular mine type associated with the case.

Table 25: Assumed Case 4 U_3O_8 Production Breakdown by Mine Type

Mine Type	U_3O_8 Produced (1,000 lb)				
	2009	2035 Projections			
		Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
Conventional	3,356	3,159	2,947	3,903	4,642
In-Situ Leach	3,744	3,525	3,287	4,355	5,178
Heap Leach	—	1,043	1,043	1,043	1,043
Total	7,100	7,728	7,277	9,302	10,862

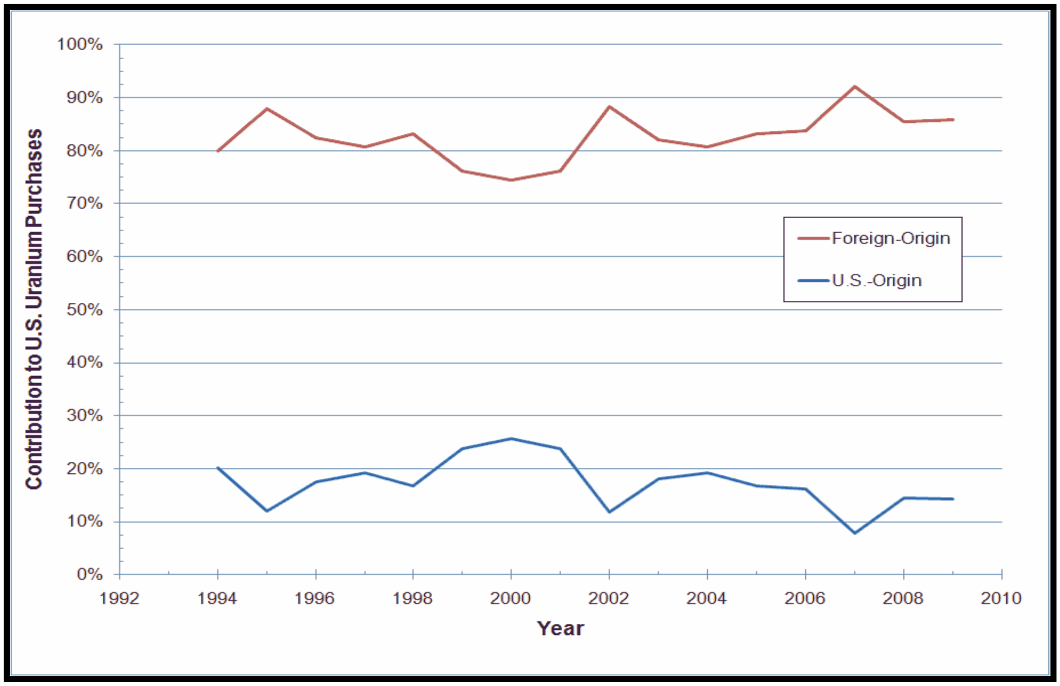
Source: EIA 2011b

The 2035 total cost and revenue estimates for uranium recovery facilities appear in Table 18 (page 75) and are based on the Table 25 U_3O_8 productions and the individual facility unit cost estimates given in Table 24. Refer to Section 6.2 for a discussion of the Table 18 total cost and revenue estimates. Table 26 gives a breakdown by facility type for Case 4, the mixed uranium recovery facility case.

Table 26: Case 4 (Mixed Uranium Recovery Facilities) Economic Projections (Nondiscounted)

Cost/Revenue	2035 Projections ($1,000)			
	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$502,305	$472,994	$604,605	$706,057
Conventional	$205,407	$191,551	$253,767	$301,726
In-Situ Leach	$229,108	$213,653	$283,048	$336,541
Heap Leach	$67,790	$67,790	$67,790	$67,790
U_3O_8 Cost	$391,584	$368,411	$472,461	$552,668
Conventional	$162,932	$151,941	$201,292	$239,334
In-Situ Leach	$180,590	$168,409	$223,108	$265,273
Heap Leach	$48,062	$48,062	$48,062	$48,062

The EIA (2010, Table S1a) shows that most of the U_3O_8 purchased in the United States is of foreign origin (see Figure 23). In 2009, the 7,100 thousand pounds of U_3O_8 produced in the United States amounted to only 14.2% of the total amount of U_3O_8 purchased. Since the total cost and revenue estimates in Table 18 (page 75) are based on the 2009 U.S.-produced U_3O_8, then those estimates include the assumption that 85.8% of the U.S.-purchased U_3O_8 is of foreign origin. As Figure 23 shows, the amount of foreign origin U_3O_8 has fluctuated over time. If all of the U_3O_8 that is purchased in the United States were to be supplied domestically, then the total cost and revenue estimates shown in Table 18 would increase by a factor of 7 (i.e., 1/0.142 = 7). However, this is considered to be unrealistic and is unsupported by the data shown in Figure 23. As an alternative, the Ref Low Import case shown in Table 18 assumes that 20% of the 2035 EIA Reference case U_3O_8 needs would be met domestically.



Source: EIA 2010, Table S1a

Figure 23: U.S. and Foreign Contribution to U_3O_8 Purchases

6.3 Economic Assessment of Proposed GACT Standards

EPA is proposing to revise Subpart W by introducing three categories related to how uranium recovery facilities manage byproduct materials during and after the processing of uranium ore. are presented and described in Section 5.4 presents and describes the proposed GACTs for each category. This section presents the costs and benefits associated with the implementation of the various components of the GACTs. The first category is the standards for conventional mill tailings impoundments. The second category consists of requirements for nonconventional impoundments where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids. Examples of this category are evaporation or holding ponds that exist at conventional mills and ISR and heap leach facilities. Requirements in this second category are that the nonconventional impoundments be provided with a double liner (Section 6.3.2) and that liquid at a depth of 1 meter be maintained in the impoundment (Section 6.3.3). The third category of revised Subpart W would require that heap leach piles be provided with a double liner (Section 6.3.4) and that the pile's moisture content be maintained above 30% by weight (Section 6.3.5). Additionally, the revised Subpart W would remove the requirement to monitor the radon flux at conventional facilities constructed on or prior to December 15, 1989 (Section 6.3.1).

6.3.1 Method 115, Radon Flux Monitoring

Existing Subpart W regulations require licensees to perform annual monitoring using Method 115 to demonstrate that the radon flux at conventional impoundments constructed before December 15, 1989, is below 20 pCi/(m^2-sec). The elimination of this monitoring requirement

would result in cost savings for the three facilities to which this requirement still applies: Sweetwater, White Mesa, and Shootaring Canyon.[9]

Radon Flux Monitoring Unit Costs

Method 115 requires that multiple large-area activated charcoal collectors (LAACCs) be employed to make radon flux measurements. The first step in preparing this cost estimate was to develop the cost for making a single LAACC radon flux measurement. Unit cost data for performing LAACC radon flux measurements were obtained from three primary sources: the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (EPA 2000a), KBC Engineers (KBC 2009), and Waste Control Specialists (WCS 2007). Weston Solutions provided fully loaded billing rates for radiation safety officers (RSOs) and certified health physicists (CHPs) (WS 2003).

MARSSIM (EPA 2000a)—MARSSIM is a multivolume document that presents methodologies for performing radiation surveys. Appendix H to MARSSIM describes field survey and laboratory analysis equipment, including the estimated cost per measurement. Included in Appendix H is the cost estimate for performing an LAACC measurement. The MARSSIM estimated cost range for LAACC radon flux measurements is $20 to $50 per measurement, including the cost of the canister. Since MARSSIM, Revision 1, was published in August 2000, it is assumed that this cost estimate is in 2000 dollars. MARSSIM does not estimate the cost for deploying the canisters or for final report preparation.

KBC Engineers (KBC 2009)—In November 2009, KBC Engineers prepared a revised "Surety Rebaselining Report" for the Kennecott Uranium Company's Sweetwater Uranium Project, which included an estimate for the cost of performing Method 115 radon flux monitoring. KBC based the canister testing cost of $50 per canister on past invoices received from Energy Laboratories, Inc. (a commercial analytical laboratory). In addition to the cost for the laboratory work, KBC included estimates for setting up and retrieving canisters in the field and for data analysis and report preparation. KBC estimated that a technician/engineer with a fully loaded billing rate of $100 per hour would require 40 hours to set up and retrieve 110 canisters, or $36.36 per canister. Also, KBC estimated that an engineer/scientist with a fully loaded billing rate of $105 per hour would require 20 hours for data analysis and report preparation for the 110 canisters, or $19.06 per canister. The KBC unit cost estimates are in 2009 dollars.

Waste Control Specialists (WCS 2007)—In its application to construct and operate a byproduct material disposal facility,[10] Waste Control Specialists, LLC (WCS) included a closure plan and corresponding cost estimate. As part of the final status survey, the radon flux through the disposal unit cap will be measured using LAACCs. WCS used the MARSSIM value as the cost for testing the canister. In addition, WCS included the cost of an RSO at $75 per hour to conduct the survey and prepare report and the cost of a CHP at $104 per hour to review the survey data. For the 100 canisters assumed, WCS assumed the RSO would require 40 hours for a cost of $30

[9] Cotter Corporation has indicated that the primary impoundments at its Cañon City site are no longer active, and thus, it has stopped performing Subpart W radon flux monitoring at that site (Thompson 2010).

[10] The WCS facility is not a conventional tailings facility or a uranium recovery facility. It was specially constructed to handle the K-65 residues that were stored at DOE's Fernald site.

per canister and the CHP would require 10 hours, or $10.40 per canister. The WCS unit costs are in 2004 dollars.

Weston Solutions (WS 2003)—Weston Solutions did not estimate the cost associated with Method 115 radon flux monitoring, but it did include the fully loaded hourly billing rates for radiation supervisors (equivalent to RSOs) and CHPs of $78 and $133, respectively. These billing rates are in 2003 dollars.

Unit Costs—Table 27 summarizes the data provided in the four source documents. The first step was to adjust all of the data to constant 2011 dollars. The CPI (DOL 2012) was used to make this adjustment. The right side of Table 27 shows the adjusted cost data.

Table 27: Data Used to Develop Method 115 Unit Costs

Data as Provided						Adjusted to November 2011 (CPI = 226.23)		
Source	Date	CPI	Cost per Canister			Cost per Canister		
			Testing	Setup/ RSO	Analysis/ CHP	Testing	Setup/ RSO	Analysis/ CHP
EPA 2000a	Aug-00	172.8	$20.00	N.G.	N.G.	$26.18	N.G.	N.G.
			$50.00	N.G.	N.G.	$65.46	N.G.	N.G.
WS 2003	Dec-03	184.3	N.G.	$31.20	$13.30	N.G.	$38.30	$16.33
WCS 2007	May-07	207.949	$25.00	$30.00	$10.40	$27.20	$32.64	$11.31
			$50.00			$54.40		
KBC 2009	Nov-09	216.33	$50.00	$36.36	$19.09	$52.29	$38.03	$19.96

N.G. = not given in the source document

Based on the data from Table 27, minimum, average, and maximum unit costs for performing Method 115 radon flux monitoring were estimated and are shown in Table 28.

Table 28: Method 115 Unit Costs

Type	LAACC Unit Cost ($/Canister)			
	Testing	Setup/RSO	Analysis/CHP	Total
Minimum	$26.18	$32.64	$11.31	$70.14
Average	$45.11	$36.32	$15.87	$97.29
Maximum	$65.46	$38.30	$19.96	$123.72

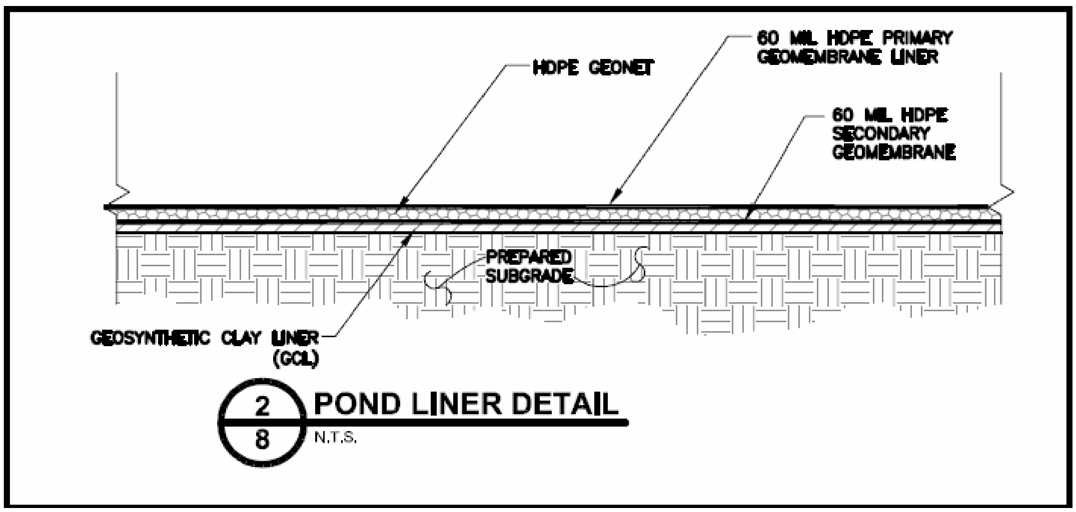
Total Annual Cost Savings (Benefit)

Method 115 requires 100 measurements per year as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. Additionally, if there are exposed beaches or soil-covered areas (as is likely at White Mesa), then an additional 100 measurements are necessary. Thus, for the three sites still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring (based on the Table 28 LAACC unit costs) is estimated to be about $9,730 per site per year for Shootaring and

Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 yr^{-1}, with a range from approximately $28,000 to $49,500 yr^{-1}.

6.3.2 Double Liners for Nonconventional Impoundments

Uranium byproduct materials are often stored in onsite impoundments at uranium recovery facilities, including in holding ponds and evaporation ponds. These ponds can be collectively referred to as nonconventional impoundments, to distinguish them from conventional tailings impoundments. This section provides an estimate of the cost to provide these nonconventional impoundments with a double liner, including a leak collection layer. Figure 24 shows a typical design of an impoundment double liner.



Source: Golder 2008, Drawing 8

Figure 24: Typical Double-Lined Impoundment with Leak Collection Layer

Double Liner Unit Costs

Unit costs, per square foot of liner, have been estimated for the three components of the double liner system: the geomembrane (HDPE) liner, the drainage (Geonet) layer, and the geosynthetic clay liner (GCL).

HDPE Unit Cost—The geomembrane (HDPE) liner installation unit cost estimates shown in Table 29 were obtained from the indicated documents and Internet sites. The Table 29 unit costs include all required labor, materials, and manufacturing quality assurance documentation costs (Cardinal 2000, VDEQ 2000). Where necessary, the unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 29 geomembrane (HDPE) liner mean unit cost is $0.95 ft^{-2}, the median cost is $0.74 ft^{-2}, while the minimum and maximum costs are $0.45 and $2.35, respectively.

Table 29: Geomembrane (HDPE) Liner Unit Costs

Data Source	Unit Cost (ft^{-2})		Thickness - Area
	As Given	2011$	
Foldager 2003	$0.37	$0.45	Not Specified
Vector 2006	$0.45	$0.50	60 mil
Cardinal 2000	$0.39	$0.51	60 mil - 470,800 SF
Cardinal 2000	$0.40	$0.52	60 mil - 138,920 SF
Earth Tech 2002	$0.45	$0.57	60 mil
Cardinal 2000	$0.47	$0.61	60 mil - 118,800 SF
VDEQ 2000	$0.48	$0.63	60 mil
Duffy 2005	$0.60	$0.70	40 mil
Get-a-Quote	$0.70	$0.70	40 mil
Cardinal 2000	$0.54	$0.71	60 mil - 60,600 SF
MWH 2008	$0.70	$0.74	40 mil
Project Navigator 2007	$0.70	$0.76	60 mil
MWH 2008	$0.80	$0.84	80 mil
Get-a-Quote	$0.86	$0.86	60 mil
EPA 2004	$0.80	$0.96	60 mil
Get-a-Quote	$1.04	$1.04	80 mil
Free Construction	$1.05	$1.05	40 mil
Free Construction	$1.69	$1.69	60 mil
Foldager 2003	$1.40	$1.72	Not Specified
Free Construction	$2.00	$2.00	80 mil
Lyntek 2011	$2.35	$2.35	80 mil

Drainage Layer (Geonet) Unit Cost—Some of the documents reviewed included unit cost estimates for installation of the drainage (Geonet) layer, as shown in Table 30. As with the geomembrane (HDPE) liner unit costs, the drainage (Geonet) layer unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 30 drainage layer (Geonet) mean unit cost is $0.64 ft^{-2}, the median cost is $0.57 ft^{-2}, while the minimum and maximum costs are $0.48 and $1.02, respectively.

Table 30: Drainage Layer (Geonet) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
EPA 2004	$0.40	$0.48
Project Navigator 2007	$0.45	$0.49
Earth Tech 2002	$0.45	$0.57
MWH 2008	$0.60	$0.63
Duffy 2005	$0.88	$1.02

Geosynthetic Clay Liner (GCL) Unit Cost—Some of the documents reviewed also included unit cost estimates for installation of the GCL, as shown in Table 31. As for the geomembrane (HDPE) liner unit costs, the CPI was used to adjust the GCL unit costs from the year they were estimated to year 2011 dollars. The Table 31 GCL mean unit cost is \$0.69 ft^{-2}; the median cost is \$0.65 ft^{-2}; and the minimum and maximum costs are \$0.45 and \$1.12, respectively.

Table 31: Geosynthetic Clay Liner (GCL) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	**2011\$**
Vector 2006	\$0.40	\$0.45
EPA 2004	\$0.40	\$0.48
Earth Tech 2002	\$0.52	\$0.65
Project Navigator 2007	\$0.70	\$0.76
Lyntex 2011	\$1.12	\$1.12

Some designs may choose to use a compacted clay layer beneath the double liner (e.g., Figure 26). However, Sandia (1998) has found that “[r]eplacing the 60 cm thick clay (amended soil) barrier layer with a GCL drastically reduced the cost and difficulty of construction.” This savings was due to avoiding the expense of obtaining the bentonite clay and the difficulties of the clay being “sticky to spread and slippery to drive on,” plus “compaction was extremely difficult to achieve.” For these reasons, it is believed that GCL will be used in most future applications and is thus appropriate for this cost estimate.

Design and Engineering—The cost estimates include a 20% allowance for design and engineering for the mean and median estimates, and a 10% and 20% allowance for the minimum and maximum estimates, respectively. The design and engineering cost has been calculated by multiplying the capital and installation cost by the allowance factor.

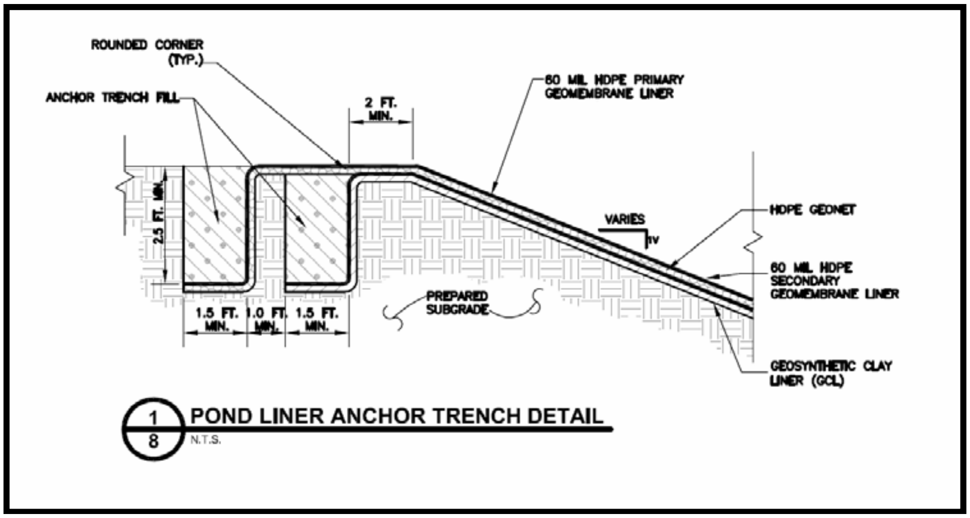
Contractor Oversight—The cost estimates include a 20% allowance for contractor oversight for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The contractor oversight cost has been calculated by multiplying the capital and installation cost by the allowance factor.

Overhead and Profit—The cost estimates include a 20% allowance for overhead and profit for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The overhead cost and profit has been calculated by multiplying the sum of the capital and installation, design and engineering, and contractor oversight costs by the allowance factor.

Contingency—The cost estimates include a contingency factor of 20% for the mean and median estimates, and 15% and 25% for the minimum and maximum estimates, respectively. The contingency has been calculated by multiplying the sum of all of the other costs by the contingency factor.

Double Liner Capital and Installation Cost

Impoundment Areas—Figure 25 shows that in order to anchor the upper liner and drainage layer (Geonet), an additional 8.5 ft of material is required on each side of the impoundment. Similarly, an additional 6 ft of material is required on each side of the impoundment to anchor the lower liner and the GCL.



Source: Golder 2008, Drawing 8

Figure 25: Typical Double Liner Anchor System

Section 6.2 describes base facilities for each type of uranium recovery facility: conventional, ISR, and heap leach. Since they are not given in Section 6.2, Table 32 shows the impoundment surface areas for each of the base facilities, plus the areas of the upper liner, drainage layer (Geonet), lower liner, and GCL. The liner areas include additional material in order to anchor the liner, plus an additional 10% to account for the sloping of the sides and waste.

Table 32: Nonconventional Impoundment Areas

Facility Type	Impoundment Type	Number	Area (acres)		
			Surface	Upper Liner & Geonet	Lower Liner & GCL
Conventional (Golder 2008)	Evaporation	10	4.13	4.94	4.82
	Total	10	41.30	49.39	48.22
ISR (Powertech 2009)	Water Storage	10	7.20	8.41	8.26
	Process Water	1	3.31	3.98	3.88
	Total	11	75.31	88.05	86.50
Heap (Titan 2011)	Raffinate	1	0.9	1.17	1.11
	Collection	1	1.5	1.88	1.81
	Evaporation	1	5.7	6.71	6.58
	Total	3	8.10	9.75	9.50

Impoundment Double Liner Cost—Based on the above estimated quantities of material and unit costs, Table 33 presents the median, minimum, and maximum capital costs for installing the

double liner beneath the impoundments of each of the three types of uranium recovery facilities: conventional, ISR, and heap leach.

Table 33: Base Facility Nonconventional Impoundment Double Liner Capital and Installation Costs

Cost Type	Conventional	ISR	Heap
Mean	$13,800,000	$24,700,000	$2,700,000
Median	$11,500,000	$20,600,000	$2,300,000
Minimum	$6,500,000	$11,600,000	$1,300,000
Maximum	$32,900,000	$58,900,000	$6,500,000
Mean, w/o Upper Liner	$6,800,000	$12,100,000	$1,300,000

To demonstrate the individual component contribution to the total capital and installation cost, Table 34 presents the calculated mean capital cost breakdown by category.

Table 34: Mean Base Facility Nonconventional Impoundment Double Liner Capital and Installation Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Impoundment Double Liner Capital and Installation Cost		
		Conventional	ISR	Heap
Upper Liner	$0.95	$2,040,654	$3,638,014	$402,799
Drainage (Geonet)	$0.64	$1,370,814	$2,443,844	$270,581
Lower Liner	$0.95	$1,992,191	$3,573,958	$392,414
GCL	$0.69	$1,455,818	$2,611,714	$286,761
Design & Engineering	20%	$1,371,895	$2,453,506	$270,511
Contractor Oversight	20%	$1,371,895	$2,453,506	$270,511
Overhead & Profit	20%	$1,920,654	$3,434,908	$378,715
Contingency	20%	$2,304,784	$4,121,890	$454,459
Total	—	$13,828,706	$24,731,338	$2,726,751

Table 33 includes capital and annual cost estimates for a mean, without upper liner case. This case was added because, even if not required to comply with 40 CFR 192.32(a)(1), the design of nonconventional impoundments at uranium recovery facilities would include at least a single liner. The reason is that the NRC, in 10 CFR 40, Appendix A, Criterion 5(A), requires that "… surface impoundments (…) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water … ." Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

Double Liner Total Annual Cost

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb.

Table 35 presents the calculated annualized cost for installation of a double liner in a nonconventional impoundment for the 2035 projected U_3O_8 productions. The annualized cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of each uranium recovery facility, and then multiplying by the projected amount of U_3O_8 produced annually. Table 35 presents four cases. In the first three cases, it was assumed that a single type of uranium recovery facility would produce all of the U_3O_8 required in 2035, while in the fourth case, it was assumed that a mixture of uranium recovery facilities would be operating in 2035. For the fourth case, Table 25 gives the contribution to the total U_3O_8 required in 2035 by each type of facility.

Table 35: Projected Nonconventional Impoundment Double Liner Annualized Capital and Installation Costs

Cost Type	Projected 2035 U_3O_8 Production	Annualized Capital and Installation Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$6,700,000	$22,700,000	$1,600,000	$14,800,000
Median	Reference Nuclear	$5,600,000	$18,900,000	$1,400,000	$12,400,000
Minimum	Low Nuclear Production	$2,900,000	$10,000,000	$700,000	$6,500,000
Maximum	Reference Low Import	$22,400,000	$76,100,000	$5,500,000	$49,300,000
Mean, w/o Upper Liner	Reference Nuclear	$3,300,000	$11,100,000	$800,000	$7,300,000

In addition to the annualized capital and installation costs, the total annual cost includes the costs associated with the operation and maintenance (O&M) of the double liner. For the double liner, O&M would consist of daily inspection of the liner and repair of the liner when rips or tears are observed above the water level or when water is detected in the leak detection layer. Since daily inspections of the nonconventional impoundments are part of the routine operation of the uranium recovery facility (Visus 2009), the only additional O&M cost associated with the double liner would be the repair costs. It was assumed that the annual O&M cost for the nonconventional impoundments would be 0.5% of the total capital cost for installing the liners (MWH 2008 and Poulson 2010). Using the Table 33 base facility cost estimates for installation of the double liner, Table 36 shows the calculated double liner O&M costs for each base facility.

Table 36: Base Facility Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	O&M Allowance	Base Facility Annual O&M Cost ($/yr)		
		Conventional	ISR	Heap
Mean	0.5%	$68,000	$120,000	$13,000
Median	0.5%	$56,000	$100,000	$11,000
Minimum	0.25%	$16,000	$29,000	$3,200
Maximum	1.0%	$330,000	$590,000	$65,000
Mean, w/o Upper Liner	0.5%	$34,000	$61,000	$6,700

Table 37 shows annual O&M costs for the projected 2035 U_3O_8 productions. The Table 37 annual O&M costs were calculated by dividing the Table 36 costs by each base facility's annual U_3O_8 production and then multiplying by the projected 2035 U_3O_8 production.

Table 37: Projected Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	Projected 2035 U_3O_8 Production	Annual Operation and Maintenance Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$1,300,000	$990,000	$50,000	$1,100,000
Median	Reference Nuclear	$1,100,000	$830,000	$39,000	$950,000
Minimum	Low Nuclear Production	$300,000	$230,000	$11,000	$250,000
Maximum	Reference Low Import	$9,000,000	$6,900,000	$330,000	$7,600,000
Mean, w/o Upper Liner	Reference Nuclear	$700,000	$500,000	$24,000	$560,000

The total annual cost for a double liner in a nonconventional impoundment is simply the sum of the annualized capital (Table 35) and installation cost plus the annual O&M cost (Table 37). Table 38 shows these total annual costs for the five cost types and four assumed uranium recovery facility cases.

Table 38: Projected Nonconventional Impoundment Double Liner Total Annual Costs

Cost Type	Projected 2035 U_3O_8 Production	Total Annual Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$8,000,000	$23,700,000	$1,700,000	$16,000,000
Median	Reference Nuclear	$6,700,000	$19,800,000	$1,400,000	$13,300,000
Minimum	Low Nuclear Production	$3,200,000	$10,200,000	$700,000	$6,800,000
Maximum	Reference Low Import	$31,400,000	$83,000,000	$5,800,000	$56,900,000
Mean, w/o Upper Liner	Reference Nuclear	$3,900,000	$11,700,000	$800,000	$7,800,000

Section 6.2, Table 18 (page 75), shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection. Table 39 compares those total U_3O_8 production costs to the double liner total costs given in Table 38. As Table 39 shows, the cost to install a double liner is less than 6% of the total cost to produce U_3O_8, while the cost to upgrade from a single liner to a double liner is less than 3% of the total cost.

Table 39: Comparison of Double Liner to Total U_3O_8 Production Costs

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)			Liner Contribution	
	Total Annual (Table 18)	Double Liner (Table 38)	Single to Double (Table 38)	Double Liner	Single to Double
Conventional	$398	$8.0	$3.9	2.0%	1.0%
In-Situ Leach	$411	$23.7	$11.7	5.8%	2.8%
Heap Leach	$356	$1.7	$0.8	0.5%	0.2%
Mixed Facilities	$396	$16.0	$7.8	4.0%	2.0%

Finally, the conventional, ISR, and heap leach base uranium recovery facilities (see Section 6.2) include a double liner, with drainage layer (Geonet) collection system for their onsite

impoundment designs. Thus, there is no additional cost for the Section 6.2 base uranium recovery facilities to meet the design and construction requirements at 40 CFR 192.32(a)(1) for onsite nonconventional impoundments.

Benefits from a Double Liner for a Nonconventional Impoundment

Including a double liner in the design of all onsite nonconventional impoundments that would contain uranium byproduct material would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, decision makers should consider this benefit because of the significance of ground water as a source of drinking water.

6.3.3 Maintaining 1 Meter of Water in Nonconventional Impoundments

As shown in Section 3.3.1, as long as a depth of approximately 1 meter of water is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine if there is any contribution above background radon values. This section estimates the cost to maintain 1 meter of water in the impoundment.

In order to maintain 1 meter, or any level, of water within a pond it is necessary to replace the water that is evaporated from the pond. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with makeup water supplied by the pond's operator. The replacement process is assumed to be required as part of the normal operation of the uranium recovery facility, which would occur regardless of the GACT. Thus, this cost estimate does not include process water replacement.

Unit Cost of Water

Three potential sources of pond makeup water were considered: municipal water suppliers, offsite non-drinking-water suppliers, and onsite water.

Municipal Water Supplier (Black & Veatch 2010)—In 2009/2010, a survey of the cost of water in the 50 largest U.S. cities was performed (Black & Veatch 2010). The survey compiled typical monthly bill data for three residential (3,750, 7,500, and 15,000 gallon/month), a commercial (100,000 gallon/month), and an industrial (10,000,000 gallon/month) water users. For this study, the commercial and industrial data were normalized to dollars per gallon, and the higher of the two values was used.

The survey found that the cost of water ranged from \$0.0012 gallon^{-1} in Sacramento, California, to \$0.0066 gallon^{-1} in Atlanta, Georgia, with a mean of \$0.0031 gallon^{-1} and a median of \$0.0030 gallon^{-1}. Looking at only those cities located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, and Texas; the survey included no cities in Utah or Wyoming), the survey found that the cost of water ranged from \$0.0016 gallon^{-1} in Albuquerque, New Mexico, to \$0.0045 gallon^{-1} in Austin, Texas, with a mean and median of \$0.0031 gallon^{-1}.

Offsite Non-Drinking-Water Suppliers (DOA 2004)—The water supplied by municipal water suppliers has been treated and is suitable for human consumption. It is not necessary for

impoundment evaporation makeup water to be drinking water grade. Therefore, using the data from the 50-city survey would likely overestimate the impoundment makeup water cost. Unfortunately, no data could be found as to the cost of non-drinking-water grade water for use as impoundment makeup water. However, another large scale use of non-drinking-water grade water is for crop irrigation, and the U.S. Department of Agriculture has compiled data on the cost of irrigation water for crops (DOA 2004).

For offsite sources of irrigation water, the Department of Agriculture states that the “31.6 million acre-feet of water received from off-farm water suppliers … cost irrigators $579 million, for an average cost of $18.29 per acre-foot of water …” (DOA 2004, page XXI), or $0.000056 gallon^{-1}.

Onsite Water (DOA 2004)—The Department of Agriculture identifies both wells (43.5 million acre-feet) and surface water (11.8 million acre-feet) as sources of onsite water. The cost for both sources is essentially the cost to pump the water from its source to where it is used. Unfortunately, the Department does not provide separate pumping costs for each onsite source, but instead states:

> *There were 497,443 irrigation pumps of all kinds used on 153,117 farms in 2003 irrigating 42.9 million acres of land. These pumps were powered by fuels and electricity costing irrigators a total of $1.55 billion or an average of $10,135 per farm. The principal energy source used was electricity, for which $953 million was spent to power 319,102 pumps that irrigated 24.1 million acres at an average cost of $39.50 per acre. Solar energy was reported as the source for pumping wells on 360 farms irrigating 16,430 acres.* [DOA 2004, page XXI]

From these data, it is possible to determine that the mean cost for pumping onsite water from both sources is $0.000086 gallon^{-1}. Also, on a per acre basis, the cost of using electricity to pump the water is slightly higher than the total average cost (i.e., $39.50 versus $36.13), and the use of solar energy to pump water is very rare (i.e., only about 0.03%).

Unit Costs—Table 40 shows the makeup water unit costs that have been estimated for this study. As described, the municipal water source costs are taken from Black & Veatch 2010, while the mean costs for offsite non-drinking and onsite water sources were taken from DOA 2004. All unit water costs were adjusted to 2011 dollars.

Although the Department of Agriculture did not present sufficient data to allow for the calculation of minimum, maximum, and median unit water costs, these costs were estimated by assuming that the cost of offsite non-drinking and onsite water sources have variation in costs similar to the variation in municipal supplier costs. Table 40 also shows these estimated makeup water unit costs.

Table 40: Makeup Water Unit Costs

Area	Source	Makeup Water Unit Costs ($gallon^{-1}$)			
		Minimum	Mean	Median	Maximum
United States	Municipal Supplier	$0.0013	$0.0033	$0.0032	$0.0069
	Offsite Non-Drinking	$0.000027	$0.000069	$0.000067	$0.000144
	Onsite Source	$0.000041	$0.00011	$0.00010	$0.00022
Potential Uranium Producing States (AZ, CO, NM, TX)	Municipal Supplier	$0.0017	$0.0032	$0.0033	$0.0047
	Offsite Non-Drinking	$0.000035	$0.000068	$0.000068	$0.000099
	Onsite Source	$0.000054	$0.00010	$0.00010	$0.00015

Additionally, Edge (2009) presents the discounted cost of estimated consumptive water use for the Piñon Ridge conventional mill. With 3% and 7% discount rates, the 40-year cost of water was presented as $58,545 and $33,766, respectively, which translates into an annual cost of $2,533. Edge (2009, page 7-2) indicates that the Piñon Ridge mill is estimated to use 227 acre-feet of water per year. This gives a water unit cost of $0.000034, which is consistent with the Table 40 offsite non-drinking and onsite water sources unit costs.

Total Annual Cost to Maintain 1 Meter of Water

Required Water Makeup Rate (Net Evaporation Rate)—As stated above, in order to maintain the water level within a nonconventional impoundment, it is necessary to replace the water that is evaporated from the impoundment. Some (and in some places all) of the evaporated water will be made up by naturally occurring precipitation. Figure 17 shows the annual evaporation (inches per year (in/yr)) of the lower 48 states, while Figure 16 shows the annual precipitation (in/yr). To determine the annual required water makeup rate, the Figure 16 data is simply subtracted from the Figure 17 data. A positive result indicates that evaporation is greater than precipitation, and makeup water must be supplied, whereas a negative result indicates that precipitation is sufficient to maintain the impoundment's water level.

The U.S. Army Corps of Engineers (ACE) has published net lake evaporation rates for 152 sites located in the United States (ACE 1979, Exhibit I). The ACE found that the net evaporation ranged from -35.6 in/yr in North Head, Washington, to 96.5 in/yr in Yuma, Arizona, with a mean of 10.8 in/yr and a median of 0.9 in/yr. At 82 sites, the evaporation rate exceeds the precipitation rate, and makeup water would be required to maintain the impoundment's water level.

Looking at only those 22 sites located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, Texas, Utah, and Wyoming), the ACE found that the net evaporation rate ranged from 6.1 in/yr in Houston, Texas, to 96.5 in/yr in Yuma, Arizona, with a mean of 45.7 in/yr and a median of 41.3 in/yr. The evaporation rate exceeded the precipitation rate at all 22 sites in the potentially uranium-producing states included in the ACE study.

Uranium Recovery Facility Pond Size—As described in Section 6.2, a base facility was assumed for each of the three types of uranium recovery facilities. Table 41 gives information for each base facility that is necessary to calculate the annual makeup water cost (i.e., the surface area of the onsite impoundments and the annul U_3O_8 production).

Table 41: Summary of Base Facility Characteristics

Parameter		Conventional	ISR	Heap
Impoundment Surface Area	(acres)	41.3	75.3	8.1
U_3O_8 Production	(lb/yr)	400,000	930,000	2,200,000

Total Annual Cost—The only cost associated with maintaining the water level within the impoundment is the cost of the water. It is assumed that existing piping will connect the nonconventional impoundment to the water source, and that the water level will be visually checked at least once per day (Visus 2009).

The makeup water unit cost data from Table 40, the net evaporation rates from above (page 102), and the impoundment areas from Table 41 are combined to calculate annual makeup water cost estimates provided in Table 42.

Table 42: Base Facility Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)		
			Conventional	ISR	Heap
Mean	$0.00010	45.7	$5,313	$9,687	$1,042
Median	$0.00010	41.3	$4,840	$8,826	$949
Minimum	$0.000035	6.1	$240	$438	$47
Maximum	$0.00015	96.5	$16,337	$29,790	$3,204

The annual cost of makeup water from Table 42 was divided by the base facility U_3O_8 annual production rate from Table 41 to calculate the makeup water cost per pound of U_3O_8 produced, shown in Table 43.

Table 43: Base Facility Makeup Water Cost per Pound of U_3O_8

Cost Type	Makeup Water Cost ($/lb)		
	Conventional	ISR	Heap
Mean	$0.0133	$0.0104	$0.00047
Median	$0.0121	$0.0095	$0.00043
Minimum	$0.00060	$0.00047	$0.000021
Maximum	$0.041	$0.032	$0.0015

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb. Table 44 shows the makeup water costs which were calculated for the U_3O_8 production projected for 2035. The first three cost estimates assume that a single type of uranium recovery facility would be responsible for producing all of the projected U_3O_8, while the last estimates assume that a mix of uranium recovery type facilities is used, as described in Section 6.2.6.

Table 44: Projected Annual Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$102,630	$80,489	$3,660	$88,979
Median	Reference Nuclear	$93,500	$73,329	$3,334	$81,063
Minimum	Low Nuclear Production	$4,366	$3,424	$156	$3,780
Maximum	Reference Low Import	$443,678	$347,963	$15,821	$381,053

Table 18 (page 75) shows the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projections. Table 45 compares those total U_3O_8 production costs to the costs for maintaining 1 meter of water in the impoundments given in Table 44. As Table 45 shows, the cost to maintain 1 meter of water in the impoundments is much less than 1% of the total cost to produce U_3O_8 for all four cases analyzed.

Table 45: Comparison of Cost to Maintain 1 Meter of Water in the Impoundments to Total U_3O_8 Production Cost

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)		1 Meter Water Contribution
	Total Annual (Table 18)	1 Meter Water (Table 44)	
Conventional	$398	$0.103	0.026%
In-Situ Leach	$411	$0.080	0.019%
Heap Leach	$356	$0.004	0.001%
Mixed Facilities	$396	$0.089	0.022%

Total Annual Benefits from Maintaining 1 Meter of Water

By requiring a minimum of 1 meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)} \qquad (6\text{-}1)$$

Where:
- A = Radon attenuation factor (unitless)
- λ = Radon-222 decay constant (sec^{-1})
  = 2.1×10^{-6} sec^{-1}
- D = Radon diffusion coefficient (cm^2/sec)
  = 0.003 cm^2/sec in water
- d = Depth of water (cm)
  = 100 cm

Solving the above equation shows that 1 meter of water has a radon attenuation factor of about 0.07. To demonstrate the impact that a 1-meter water cover would have, the doses and risks reported in Section 4.4, Table 13 (page 49), have been recalculated. In this recalculation, it was assumed that an additional 1 meter of water covered all of the radon sources. Table 46 shows the results of this recalculation, in terms of the dose and risk reduction attributable to covering the

source area with 1 meter of water. Table 46 shows both the original radon release (as reported in Table 13, page 49) and the radon release after the source area has been covered with 1 meter of water.

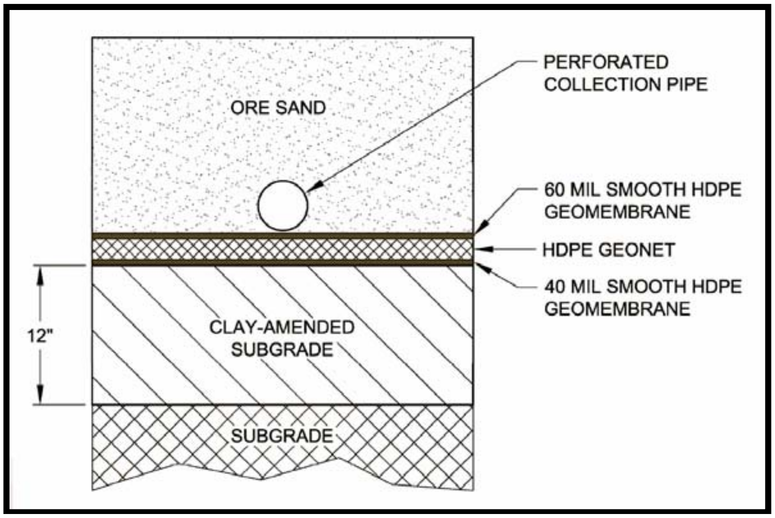
Table 46: Annual Dose and Risk Reduction from Maintaining 1 Meter of Water in the Impoundments

Uranium Site	Radon Release (Ci/yr)		Annual Dose Reduction		LCF[(a)] Risk Reduction (yr^{-1})	
	Table 13	1 Meter Water	Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	147	0.5	1.1	2.7E-06	5.6E-07
White Mesa	1,750	124	4.8	11.1	3.2E-05	5.9E-06
Smith Ranch - Highlands	36,500	2,590	3.4	1.4	2.1E-05	7.2E-07
Crow Butte	8,885	630	2.5	3.1	1.6E-05	1.6E-06
Christensen/Irigaray	1,600	114	3.5	1.8	2.2E-05	9.2E-07
Alta Mesa	740	52	20.1	10.7	1.2E-04	5.7E-06
Kingsville Dome	6,958	494	53.9	10.5	3.5E-04	5.7E-06

* LCF = latent cancer fatalities

6.3.4 Liners for Heap Leach Piles

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap piles. Figure 26 shows a typical design of a heap leach pile double liner. Although Figure 26 shows a clay-amended layer beneath the double liner, for the reasons given in Section 6.3.2, this cost estimate has assumed that a GCL would be used beneath the double liner, as shown in Figure 24.



Source: Titan 2011

Figure 26: Typical Heap Pile Liner

Double Liner Unit Costs

The unit costs for installing a double liner, with a leakage collection system, to a heap leach pile are assumed to be the same as the units costs developed in Section 6.3.2 for nonconventional impoundments.

The base heap leach facility utilizes a conveyor to deliver crushed material to the pile (Titan 2011). However, if material is delivered to the pile by truck, then the truck would put additional stress on the liner. Additional costs would be incurred to protect the liner from the additional stress. Because this analysis uses a range of liner unit costs, the additional costs for protecting the liner if truck loading is employed have been enveloped.

Total Cost of Heap Leach Pile Double Liner

Section 6.2.2 base heap leach facility (i.e., Sheep Mountain in Wyoming) includes two 80-acre heap piles. Using the same method described for the nonconventional impoundment (page 96), it was estimated that 90.3 acres of material would be required for the upper liner and drainage (Geonet) layer, and 89.6 acres of material for the lower liner and GCL. With these quantities of material and the unit costs from Section 6.3.2, Table 47 presents the median, minimum, and maximum capital and installation costs for installing the double liner beneath the two 80-acre heap piles.

Table 47: Heap Pile Double Liner Capital and Installation Costs

Cost Type	Capital and Installation Cost
Mean	$25,200,000
Median	$20,600,000
Minimum	$11,900,000
Maximum	$60,700,000
Mean, w/o Upper Liner	$12,900,000

Table 47 includes capital and annual cost estimates for a Mean, w/o Upper Liner case. This case was added because even if not required to meet the requirements at 40 CFR 192.32(a)(1), the design of the heap leach pile would include at least a single liner to collect the lixiviant flowing out of the heap. The reason is that since the lixiviant flowing out of the heap contains the uranium, it is in the licensee's economic interest to recover as much of it as possible, and since the rinsing liquid would be mixed with the lixiviant, it too would be recovered. Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

To demonstrate the individual component contribution to the total capital and installation cost, Table 48 presents a breakdown by component of the calculated mean capital and installation cost.

Table 48: Mean Heap Pile Double Liner Capital Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Heap Pile Double Liner Capital Cost
Upper Liner	$0.95	$3,730,077
Drainage (Geonet)	$0.64	$2,505,687
Lower Liner	$0.95	$3,702,230
GCL	$0.66	$2,579,315
Design & Engineering	20%	$2,503,462
Contractor Oversight	20%	$2,503,462
Overhead & Profit	20%	$3,504,847
Contingency	20%	$4,205,816
Total	—	$25,234,896

Table 49 presents the heap pile double liner annual cost estimates. The total annual cost is the sum of the annualized capital and installation cost and the annual O&M cost. The annualized capital cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of the heap leach facility, and then multiplying by the amount of U_3O_8 produced annually. The U_3O_8 annual production was based on 2035 projections made in Section 6.2.6.

Table 49 presents two cases. In the first case, it was assumed that all of the U_3O_8 required in 2035 would be produced by heap leach facilities, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 49: Heap Pile Double Liner Annual Costs

Case	Cost Type	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost
Heap Only	Mean	$15,100,000	$220,000	$15,300,000
	Median	$12,300,000	$180,000	$12,500,000
	Minimum	$6,700,000	$60,000	$6,800,000
	Maximum	$51,100,000	$1,340,000	$52,400,000
	Mean, w/o Upper Liner	$7,700,000	$110,000	$7,800,000
Mix	Mean	$340,000	$5,000	$350,000
	Median	$280,000	$4,000	$280,000
	Minimum	$160,000	$1,000	$160,000
	Maximum	$1,600,000	$43,000	$1,600,000
	Mean, w/o Upper Liner	$170,000	$3,000	$170,000

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for installing a double liner under the heap leach pile is about 4% of the total cost of heap leach U_3O_8 production (i.e., $15.3 million/$356 million), while the cost to change from a single liner to a double liner is about 2% of the total cost of heap leach U_3O_8 production (i.e., $7.8 million/$356 million).

Finally, the Section 6.2.2 base heap leach facility design includes a double liner, with drainage layer (Geonet) collection system, as shown in Figure 26. Thus, there is no additional cost for the Section 6.2.2 base heap leach facility to meet the design and construction requirements at 40 CFR 192.32(a)(1).

Benefits from a Double-Lined Heap Leach Pile

Including a double liner in the design of all heap leach piles would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, it is important for decision makers to consider this benefit because of the significance of ground water as a source of drinking water.

6.3.5 Maintaining Heap Leach Piles at 30% Moisture

As described in Section 5.4, the goal of this GACT is to maintain 30% moisture content in the heap leach pile so that the radon flux will be no larger than the flux from dry ore.

Simply adding water to the surface of the heap leach pile will replenish and maintain the moisture content in the surface layer. The moisture content in the remainder of the heap leach

vertical profile will be a function of the ore materials ability to retain moisture. The field moisture capacity of any earthen material is a function of the grain size and the mineralogy of the materials. Accordingly, the 30% moisture content should be attained with all low grade ore materials, due to the presence of significant fine-grained materials. Furthermore, it may not be necessary to maintain the entire pile at 30% moisture content, but only the upper portion of the pile. The exact depth to which the 30% moisture content requirement would apply would be determined on a site by site basis. The cost to supply the water to replenish the pile's moisture content has been estimated below.

It is also recognized that imposing a 30% moisture content requirement on the pile might (and likely, would) require certain design changes to the pile. Principal concerns to be addressed during pile design are slope stability and the liquefaction potential. Regarding slope stability, many leach piles are provided with containment dikes which provide structural support to the pile. The 30% moisture content requirement will have little or no effect on the moisture associated with the containment dikes, and thus the dikes would continue to provide support. Additionally, the pile design may be altered to increase its stability. For example, lower slopes, higher confinement dikes, the construction of stair-step pad grade, or the installation of textured (as opposed to smooth) geomembrane liner in critical areas would enhance pile stability.

Regarding liquefaction potential, it has been estimated that liquefaction is unlikely if the degree of saturation in the pile is less than about 85% (Sassa 1985, as referred to in Smith 2002, Thiel and Smith 2004). Assuming a 2.7 ratio between moisture content and saturation (NRC 1984), the 30% moisture content require translates into 81% saturation, which is slightly below the level required for liquefaction. Needless to say, with the increase in the saturation that will result from the imposition of the 30% moisture content requirement, more attention will need to be paid to the pile design to minimize the liquefaction potential.

The costs associated with these design changes have not been included in the following cost estimate because any design change would depend very much on the site's characteristics, and in many cases the design change might be inexpensive to implement if it is identified during the design phase. For example, using a textured rather than smooth liner, constructing higher containment dikes, and using stair-step pad grade could all be incorporated into the pile's design at minimal, if any, additional cost.

Unit Water Cost

The unit costs for providing water to a heap leach pile are assumed to be the same as the unit costs developed in Section 6.3.3 (page 100) for providing water to nonconventional impoundments.

Cost of Soil Moisture Meters

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors (Irrometer 2010). The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft) (Ben Meadows 2012).

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair (Spectrum 2011, Spectrum 2012).

Total Annual Cost to Maintain 30% Moisture in the Heap Leach Pile

The only cost associated with maintaining the moisture level within the pile is the cost of the water. It is assumed that existing piping (used to supply lixiviant to the pile during leaching) would be used to supply water necessary for maintaining the moisture level. Also, it is assumed that the in-soil method for moisture monitoring would be used, and that the above costs are insignificant. Finally, it is assumed that moisture readings would be performed during the daily inspections of the heap pile (Visus 2009), with no additional workhours.

The base heap leach facility includes a heap pile that will occupy up to 80 acres at a height of up to 50 ft. With an assumed porosity of 0.39 (see Section 5.1.5, page 56) and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 50 presents the calculated cost for makeup water to maintain the moisture level in the heap pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates derived in Section 6.3.3 were used for this estimate.

Table 50: Heap Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of makeup water in perspective, during leaching and rinsing of the pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2) (Titan 2011), or about 4,220 in/yr. This application rate is almost two orders of magnitude larger than the mean net evaporation rate, and is over a factor of 40 larger than the maximum net evaporation rate, shown in Table 50, and should be sufficient to maintain the moisture content within the pile

Section 6.2.6 and Table 25 (page 89) present projections of the U_3O_8 production for the year 2035. Table 51 presents the annual cost for makeup water to maintain the heap pile's moisture content. Table 51 presents two cases. In the first case, Heap Only, it was assumed that heap leach facilities would produce all of the U_3O_8 required in 2035, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 51: Projected Annual Heap Pile Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)	
		Heap Only	Mix
Mean	Reference Nuclear	$15,000	$300
Median	Reference Nuclear	$14,000	$300
Minimum	Low Nuclear Production	$650	$20
Maximum	Reference Low Import	$66,000	$2,100

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for maintaining 30% moisture in the heap leach pile is well under 1% of the total cost of heap leach U_3O_8 production (i.e., $15,000/$356,000,000).

Total Annual Benefits from Maintaining 30% Moisture in the Heap Leach Pile

By requiring a minimum 30% by weight moisture content in the heap leach pile, the release of radon from these piles would be reduced by up to about a factor of 2½, as shown in Figure 15. From the base case production profile (BRS 2011, page 86), it can be determined that the heap pile ore has a mean U-238 concentration of 213 pCi/g, and a range of 135 to 321 pCi/g. Assuming the normalized radon flux from a heap pile with 30% moisture content is 1 pCi/(m^2-sec) per pCi/g Ra-226, and that the Ra-226 is in equilibrium with the U-238, then the mean annual radon release from the 80-acre heap pile would be 2,180 Ci/yr. A comparable annual radon release from a dryer heap pile could be as high as 5,450 Ci/yr. Table 52 shows a comparison of annual doses and risks using these heap pile annual radon releases and the release to dose/risk relationship for the Western Generic site from Table 13.

Table 52: Annual Dose and Risk Comparison for Maintaining 30% Moisture Content in the Heap Pile

Heap Pile Moisture Content (by Weight)	Radon Release (Ci/yr)	Annual Dose		LCF[(a)] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
>30%	2,180	6.3	7.5	3.4E-04	9.6E-06
<30%	5,450	16	19	8.4E-04	2.4E-05

* LCF = latent cancer fatalities

Of course the exact reduction will depend upon the specific heap pile. For example, if a heap pile is operating at 20% moisture content without the GACT, then according to Figure 15, imposing the GACT would result in a radon flux reduction of about a factor of 1.6. Also, as Figure 14 shows, the response of the radon emanation coefficient to increasing moisture is very dependent on the material. This relationship between the emanation coefficient, moisture content, and material also influences the amount of reduction provided by the GACT.

6.3.6 Summary of Proposed GACT Standards Economic Assessment

Sections 6.3.2 through 6.3.5 presents the details of the economic assessment that was performed for implementing each of the four proposed GACT standards. **Table 53** presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, **Table 53** presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of **Table 53**.

Table 53: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	—	—	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the **Table 53**, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

Included in the Section 6.2 descriptions is the operational duration and amount of uranium produced by each reference facility. This information from Section 6.2 has been used to calculate an annual U_3O_8 production rate for each type facility, which in turn has been coupled with the unit costs provided in **Table 53**, to generate the annual cost for implementing each GACT at each reference facility. These annual costs are presented in **Table 54**. Again for comparison the baseline cost (without the GACTs) is provided at the bottom of **Table 54** for each type facility.

Table 54: Proposed GACT Standards Reference Facility Annual Costs

	Reference Facility Annual Cost ($/yr)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$410,000	$2,900,000	$230,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$5,300	$9,700	$1,100
GACT – Liners for Heap Leach Piles	—	—	$2,100,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4,500
GACTs – Total for All Four	$420,000	$2,900,000	$2,300,000
Baseline Facility Costs	$21,000,000	$49,000,000	$48,000,000

Based on EIA (EIA 2011a) nuclear power productions, Section 6.2.6 estimated the U.S. U_3O_8 productions until the year 2035. Using those EIA-based production estimates for 2011 and 2035 and the unit cost values from **Table 53**, **Table 55** presents the estimated national annual cost for implementing the proposed GACTs.

Table 55: Proposed GACT Standards National Annual Costs

	National Annual Cost ($1,000/yr)			
	2011 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,500	$12,000	$0	$15,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$45	$40	$0	$85
GACT – Liners for Heap Leach Piles	—	—	$0	$0
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0	$0
GACTs – Total for All Four	$3,600	$12,000	$0	$15,000
Baseline Facility Costs	$180,000	$200,000	$0	$380,000
	2035 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,300	$11,000	$230	$14,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$42	$37	$1.1	$80
GACT – Liners for Heap Leach Piles	—	—	$2,100	$2,100
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4.5	$4.5
GACTs – Total for All Four	$3,300	$11,000	$2,300	$17,000
Baseline Facility Costs	$160,000	$190,000	$48,000	$400,000

Since no facilities were operating, it was assumed that all 2011 U_3O_8 production was divided between conventional and ISL facilities with the 2009 ratio, as shown in Table 25 (i.e., 47.3% conventional and 52.7% ISL). As described in Section 6.2.6, for 2035 it was assumed that one

heap leach facility would be operational, and that the remainder of the U_3O_8 production would be divided between conventional and ISL facilities with the 2009 ratio.

Of course, if the amount of U_3O_8 produced by each type facility changes the annual cost to implement the GACTs changes as well. For example if in 2035 all U_3O_8 is produced by ISL facilities, then the national annual cost to implement the GACTs would increase from $17 million (as shown in **Table 55**) to $24 million. Alternatively, if all 2035 U_3O_8 is produced by conventional facilities, then the national annual cost to implement the GACTs would decrease to $8.1 million. Because the baseline U_3O_8 production costs are fairly constant across all three types of uranium recovery facilities (see **Table 53** and Sections 6.2.1 through 6.2.4), the 2035 baseline U_3O_8 production national annual cost would remain fairly constant around $400 million, regardless of how the U_3O_8 is produced.

Table 56 presents the national cost for the implementation of the four proposed GACTs summed over the years 2011 to 2035. As with the **Table 55** annual national costs, the **Table 56** summed national costs are based on EIA (EIA 2011a) nuclear power productions, as described in Section 6.2.6.

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Non-Discounted			
	Conventional	ISL	Heap Leach	Total
GACT – Double Liners for Nonconventional Impoundments	$81,000	$270,000	$5,800	$350,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$1,000	$910	$27	$2,000
GACT – Liners for Heap Leach Piles	—	—	$52,000	$52,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$110	$110
GACTs – Total for All Four	$82,000	$270,000	$58,000	$410,000
Baseline Facility Costs	$4,000,000	$4,600,000	$1,200,000	$9,800,000
	Discounted @3%			
	Conventional	ISL	Heap Leach	Total
GACT – Double Liners for Nonconventional Impoundments	$58,000	$190,000	$4,100	$250,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$740	$650	$19	$1,400
GACT – Liners for Heap Leach Piles	—	—	$37,000	$37,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$80	$80
GACTs – Total for All Four	$59,000	$190,000	$41,000	$290,000
Baseline Facility Costs	$2,900,000	$3,300,000	$850,000	$7,000,000

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Discounted @ 7%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$40,000	$130,000	$2,900	$170,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$510	$450	$13	$970
GACT – Liners for Heap Leach Piles	—	—	$26,000	$26,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$55	$55
GACTs – Total for All Four	$41,000	$130,000	$29,000	$200,000
Baseline Facility Costs	$2,000,000	$2,300,000	$590,000	$4,800,000

As with the **Table 55** annual national costs, if the amount of U_3O_8 assumed to be produced by each type facility changes the **Table 56** summed national costs to implement the GACTs changes as well. For example if all U_3O_8 is produced by ISL facilities, then the non-discounted summed national cost to implement the GACTs would increase from $410 million (as shown in **Table 56**) to $590 million. Alternatively, if all U_3O_8 is produced by conventional facilities, then the non-discounted summed national cost to implement the GACTs would decrease to $200 million. Similar to the baseline annual national costs, the baseline U_3O_8 production non-discounted summed national cost would remain around $9.8 billion, regardless of how the U_3O_8 is produced.

6.4 Environmental Justice

Concerning environmental justice, EPA's economic assessment guidelines state:

> *Distributional analyses address the impact of a regulation on various subpopulations. Minority, low-income and tribal populations may be of particular concern and are typically addressed in an environmental justice (EJ) analysis. Children and other groups may also be of concern and warrant special attention in a regulatory impact analysis.* [EPA 2010, Section 10]

6.4.1 Racial Profile for Uranium Recovery Facility Areas

This section presents information on the racial (e.g., tribal populations) and economic (e.g., low income) profiles of the areas surrounding existing and proposed uranium recovery facilities.

Table 57 presents the racial profiles in the immediate areas (i.e., counties) surrounding the existing and proposed uranium recovery facilities, while Table 58 presents the profiles in the surrounding regional area (i.e., states) and on a national basis. A comparison of Table 57 to Table 58 indicates whether the racial population profile surrounding the uranium recovery facilities conform to the national and/or regional norms.

Table 57: Racial Profile for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	White	Black	Native American	Others
Juan Tafoya	Conventional	McKinley, NM	22.2%	0.4%	75.4%	2.0%
White Mesa Mill	Conventional	San Juan, UT	42.7%	0.1%	55.8%	1.3%
Grants Ridge	Heap Leach	Cibola, NM	56.2%	1.0%	40.9%	1.8%
Sheep Mountain	Heap Leach	Fremont, WY	78.3%	0.1%	19.8%	1.8%
Crow Butte	In-Situ Leach	Dawes, NE	94.5%	0.9%	3.0%	1.6%
Piñon Ridge	Conventional	Montrose, CO	96.6%	0.4%	1.4%	1.7%
Sweetwater Mill	Conventional	Sweetwater, WY	96.3%	0.8%	1.1%	1.9%
Christensen / Irigaray	In-Situ Leach	Campbell, WY	97.4%	0.2%	1.0%	1.4%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	97.5%	0.1%	1.0%	1.4%
Shootaring Canyon	Conventional	Garfield, CO	97.2%	0.5%	0.8%	1.6%
Kingsville Dome	In-Situ Leach	Kleberg, TX	92.8%	3.9%	0.8%	2.6%
Goliad	In-Situ Leach	Goliad, TX	93.6%	5.0%	0.7%	0.7%
Palangana	In-Situ Leach	Duval, TX	98.3%	0.6%	0.7%	0.4%
Alta Mesa	In-Situ Leach	Brooks, TX	98.8%	0.4%	0.6%	0.3%

Source: http://www.census.gov/popest/counties/asrh/

Table 58: Regional and National Racial Profiles

State		White	Black	Native American	Others
New Mexico	NM	85.4%	2.1%	9.8%	2.7%
Wyoming	WY	95.1%	0.8%	2.3%	1.8%
Utah	UT	94.0%	0.9%	1.4%	3.7%
Colorado	CO	90.7%	4.0%	1.2%	4.1%
Nebraska	NE	92.7%	4.1%	0.9%	2.3%
Texas	TX	83.7%	11.8%	0.7%	3.9%
United States	US	81.1%	12.7%	0.9%	5.3%

Source: http://www.census.gov/popest/counties/asrh/

At 10 of the 15 sites, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is White exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either Black or Other is less than the national norm, while the percentage of Blacks and Others is less than the regional norm at all but one site.

For all of the sites considered together, the data in Table 57 do not reveal a disproportionately high incidence of minority populations being located near uranium recovery facilities. However, certain individual sites may be located in areas with high minority populations. Those sites would need to be evaluated during their individual licensing processes.

6.4.2 Socioeconomic Data for Uranium Recovery Facility Areas

Table 59 shows the socioeconomic data for the immediate areas (i.e., counties) surrounding the existing and planned uranium recovery facilities. Specifically, the socioeconomic data shown in Table 59 is the fraction of land that is farmed, the value of that farmland, and the nonfarm per capita wealth. The percentages shown next to the value of that farmland and the nonfarm per capita wealth indicate where the site ranks when compared to all other counties in the United States.

Table 59: Socioeconomic Data for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	Farm Land	Farm Value Per Hectare		Per Capita Nonfarm Wealth	
White Mesa Mill	Conventional	San Juan, UT	31.1%	$670	4.0%	$103,073	0.6%
Juan Tafoya	Conventional	McKinley, NM	90.9%	$185	0.0%	$115,603	1.9%
Alta Mesa	In-Situ Leach	Brooks, TX	72.8%	$1,423	13.2%	$117,693	2.2%
Grants Ridge	Heap Leach	Cibola, NM	58.2%	$378	0.7%	$118,862	2.4%
Palangana	In-Situ Leach	Duval, TX	74.1%	$1,792	17.5%	$132,493	6.9%
Crow Butte	In-Situ Leach	Dawes, NE	88.0%	$895	6.9%	$144,291	15.1%
Kingsville Dome	In-Situ Leach	Kleberg, TX	0.0%	$1,478	13.9%	$149,865	20.4%
Goliad	In-Situ Leach	Goliad, TX	92.6%	$2,244	22.0%	$162,584	35.4%
Piñon Ridge	Conventional	Montrose, CO	23.3%	$2,916	30.1%	$181,133	59.5%
Sheep Mountain	Heap Leach	Fremont, WY	42.6%	$768	5.3%	$186,775	65.4%
Shootaring Canyon	Conventional	Garfield, CO	21.4%	$3,195	34.3%	$200,316	76.7%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	92.5%	$381	0.7%	$208,583	82.1%
Christensen/Irigaray	In-Situ Leach	Campbell, WY	97.3%	$437	1.1%	$225,858	89.3%
Sweetwater Mill	Conventional	Sweetwater, WY	22.2%	$242	0.1%	$232,504	91.2%

The discussion first focuses on the per capita nonfarm wealth. For comparison, the per capita nonfarm wealth in the United States ranges from $39,475 (Slope County, North Dakota) to $618,954 (New York County, New York). Table 59 shows that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are very well to do (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the 50^{th} percentile in the United States. On the other hand, five sites are located in areas in which the per capita nonfarm wealth is below the country's 10^{th} percentile.

Table 59 shows that eight of the sites have more than 50% of their land devoted to farming. However, the Table 59 farm value data show that the farmland for all 15 sites is below the 35^{th} percentile farmland value in the United States. This could indicate that the farmland is of poor quality, or simply that the land is located in an economically depressed area. For comparison, farmland in the United States ranges in value from $185 per hectare (McKinley County, New Mexico, which is the location of the proposed Juan Tafoya uranium recovery facility) to $244,521 per hectare (Richmond County, New York).

For all of the sites combined, the data provided in Table 59 do not reveal a disproportionately high incidence of low-income populations being located near uranium recovery facilities. However, certain individual sites may be located within areas of low-income population. Those sites would need to be evaluated during their individual licensing processes.

6.5 Regulatory Flexibility Act

The Regulatory Flexibility Act requires federal departments and agencies to evaluate if and/or how their regulations impact small business entities. Specifically, the agency must determine if a regulation is expected to have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

If a rulemaking is determined to have a significant economic impact on a substantial number of small entities, then the agency must conduct a formal regulatory flexibility analysis. However, if the agency determines that a rulemaking does not have a significant economic impact on a substantial number of small entities, then it makes a certification of that finding and presents the analyses that it made to arrive at that conclusion.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with 40 CFR 192.32(a)(1) (see Section 5.4). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the agency is proposing to eliminate the distinction made in the 1989 rule between impoundments constructed pre-1989 and post-1989, since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored annually to demonstrate that the average Rn-222 flux does not exceed 20 pCi/(m^2-sec).

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are the White Mesa mill and the proposed Piñon Ridge mill owned by Energy Fuels; the Shootaring Canyon mill owned by Uranium One, Inc.; and the Sweetwater mill owned by Kennecott Uranium Co. . Of the three companies that own conventional mills, one, Energy Fuels, is classified as a small business, on the basis that they have fewer than 500 employees (EF 2012 states that Energy Fuels has 255 active employees in the U.S.).

Energy Fuels’ White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full, it will be contoured and covered. Then, a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings.

Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Section 5.4 describes the proposed GACTs. Because both the White Mesa mill and the proposed Piñon Ridge mill are in compliance with the proposed GACT, it can be concluded that the rulemaking will not impose any new economic impacts on small business (i.e., Energy Fuels). For White Mesa, the proposed rule will actually result in a cost saving as Energy Fuels will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in 40 CFR 192.32(a)(1) and that a minimum depth of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to ISL facilities and heap leach facilities. Currently, there are six operating ISLs (as shown in Table 8) and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco; Alta Mesa owned by Mestena Uranium, LLC; Willow Creek owned by Uranium One, Inc.; and Hobson and La Palangana owned by Uranium Energy Corp. Again, using the criterion of fewer than 500 employees, Mestena Uranium, LLC, and Uranium Energy Corp. are small businesses, while both Cameco and Uranium One, Inc., which is owned by Rosatom, are large businesses.

All of the evaporation ponds at the four conventional mills and the six ISLs were built in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

In addition to the operating ISLs listed above, Table 9 shows that there are nine ISLs have been proposed for licensing. These are: Dewey Burdock owned by Powertech Uranium Corp.; Nichols Ranch owned by Uranerz Energy Corp.; 'Jab and Antelope' and Moore Ranch owned by Uranium One Americas, Inc., a subsidiary of Rosatom; Church Rock and Crownpoint owned by Hydro Resources, Inc. a subsidiary of Uranium Resources, Inc.; Ross owned by Strata Energy Inc., a subsidiary of Australian-based Peninsula Energy Limited; Goliad owned by Uranium Energy Corp.; and Lost Creek owned by Lost Creek ISR, LLC a subsidiary of Ur-Energy. All of these companies, except Rosatom, are small businesses.

According to the licensing documents submitted by the owners of the proposed ISLs, all will be constructed in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and while in standby status.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to \$0.03 per pound of U_3O_8 produced. Considering that the current (i.e., January 30, 2012) price

of U_3O_8 is $52 per pound (UxC 2012), this cost does not pose a significant impact to any of these small entities.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30-percent moisture content by weight during operations. Although no heap leach facilities are currently licensed, the small business Energy Fuels is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that has been presented (Titan 2011), the Energy Fuels facility will have an evaporation pond, a collection pond, and a raffinate pond. All three ponds will be double lined with leak detection. Based on the unit and facility cost comparisons presented in **Table 53** and **Table 54**, respectively, the implementation of the proposed GACTs at a heap leach facility (such as Sheep Mountain) would increase the U_3O_8 production cost by about 5%. Based on this small increase, the Sheep Mountain Project would: 1) remain competitive with U_3O_8 production cost for other types of facilities, and 2) continue to provide Energy Fuels with a profit. Energy Fuels is the only entity known to be preparing to submit a license application for a heap leach facility.

Of the 20 uranium recovery facilities identified above, 13 are owned by small businesses. As documented above in this report, those 13 facilities are either already in compliance with the proposed GACTs, with no additional impact, or compliance with the GACTs would not pose a significant impact to any of the small businesses (e.g., $52.03 lb^{-1} versus $52 lb^{-1}). Thus, after considering the economic impacts of this proposed rule on small entities, it is concluded that this action will not have a significant economic impact on a substantial number of small entities.

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EPA-3013

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Subpart W Proposed Rule.msg

- FW Subpart W Proposed Rule.msg

From: Rosnick, Reid
Sent: Tuesday, April 22, 2014 11:27 AM
To: Angelique Diaz
Subject: FW: Subpart W Proposed Rule

Angelique,

I can’t seem to find Jay or Phil email. Would you mind? Below is the template I used.

From: Rosnick, Reid
Sent: Monday, April 21, 2014 2:21 PM
To: 'sarah@uraniumwatch.org'
Subject: Subpart W Proposed Rule

Hello Sarah,

FYI, the signed copy of the Subpart W proposed rule is now on our website at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html. Please note that this is the prepublication version, and that as soon as the proposal is published in the Federal Register we will replace it and begin the 90 day comment period. Thank you.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-2920

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Docket Switcheroo.msg

- Docket Switcheroo.msg

From: Rosnick, Reid
Sent: Tuesday, April 22, 2014 8:04 AM
To: Miller, Beth
Subject: Docket Switcheroo

Hi Beth,

OK, please take the attached document and pdf it. Then, in the docket, please remove the document at EPA-HQ-OAR-2008-218-DRAFT-0087 and replace it with the newly pdf document.

Then, please add the attached Stakeholder Conference Call notes from April 3, 2014 as a new docket entry.

Thank you Beth!

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250)

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

February 2014

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ACRONYMS AND ABBREVIATIONS

ACE	Army Corps of Engineers
AEA	Atomic Energy Act
AIRDOS	AIR DOSe
ALARA	as low as reasonably achievable
AMC	American Mining Congress
ANPR	Advance Notice of Proposed Rulemaking
$BaCl_2$	barium chloride
BEIR	Biological Effects of Ionizing Radiation
BID	background information document
CAA	Clean Air Act
CAP88	Clean Air Act Assessment-1988
CFR	*Code of Federal Regulations*
CHP	certified health physicist
Ci/yr	curies per year
cm	centimeter
cm/sec	centimeter per second
cm^2/sec	square centimeter per second
CPI	consumer price index
CPP	Central Processing Plant
DARTAB	Dose And Risk TABulation
DOE	Department of Energy
EDF	Environmental Defense Fund
EIA	Energy Information Administration
EIS	environmental impact statement
EPA	Environmental Protection Agency
E-PERM	Electric Passive Environmental Radon Monitor
FGR	Federal Guidance Report
FR	*Federal Register*
ft	feet
g/cc	gram per cubic centimeter
G&A	general and administrative

GACT	generally available control technology
GCL	geosynthetic clay liner
GHG	Greenhouse Gas
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HRTM	Human Respiratory Tract Model
ICRP	International Commission on Radiological Protection
in/yr	inches per year
ISL	in-situ leach
ISR	in-situ recovery
km	kilometer
L	liter
LAACC	large-area activated charcoal collector
lb	pound
LCF	latent cancer fatalities
L/d	liters per day
LLDPE	linear low-density polyethylene
LoC	line of credit
m^2	square meters
m^3/hr	cubic meters per hour
m/sec	meters per second
MACT	maximum achievable control technology
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mi	mile
MIR	maximum individual risk
mph	miles per hour
mrem	millirem
mSv	millisievert
N.C.	not calculated
NESHAP	National Emission Standard for Hazardous Air Pollutants

N.G.	not given
NMA	National Mining Association
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
O&M	operation and maintenance
ORISE	Oak Ridge Institute for Science and Education
pCi	picocurie
pCi/(ft^2-sec)	picocurie per square foot per second
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/(m^2-sec)	picocurie per square meter per second
PIPS	passive implanted planar silicon
POO	Plan of Operation
PVC	polyvinyl chloride
R&D	research and development
Ra	radium
RADRISK	RADiation RISK
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent in man
RMEI	reasonably maximally exposed individual
Rn	radon
RSO	radiation safety officer
SC	Sierra Club
SF	square foot
tpd	tons per day
U	uranium
U_3O_8	triuranium octoxide
UMTRCA	Uranium Mill Tailings Remedial Control Act
WCS	Waste Control Specialists, LLC
WL	working level
WLM	working level month
ZnS(Ag)	silver doped zinc sulfide

1.0 EXECUTIVE SUMMARY

The purpose of this report is to present the reader with an understanding of the facilities being regulated under this National Emission Standard for Hazardous Air Pollutant (NESHAP). The report also presents the technical bases that the Environmental Protection Agency (EPA or the Agency) has used for evaluating the risks from existing facilities and for determining that the prescribed work practice standards represent generally available control technology (GACT), as required by section 112(d) of the 1990 amendments to the Clean Air Act (CAA).

The Agency is also defining the scope of its review of the Subpart W NESHAP to include the waste impoundments at in-situ leach (ISL) uranium recovery facilities and heap leach recovery operations, since all post-1989 impoundments, which potentially contain uranium byproducts, are considered to be under the NESHAP. The Agency has defined the scope of the review to include regulation of the heap leach pile, as it believes the pile contains byproduct material during operations.

1.1 Introduction, History, and Basis

After a brief introduction, this report describes the events that led the Agency to promulgate a NESHAP for radon emissions from operating uranium mill tailings on December 15, 1989, in Section 40 of the *Code of Federal Regulations* (40 CFR) Part 61, Subpart W. The 1977 amendments to the CAA include the requirement that the Administrator of EPA determines whether radionuclides should be regulated under the act. In December 1979, the Agency published its determination in the *Federal Register* (FR) that radionuclides constitute a hazardous air pollutant (HAP) within the meaning of section 112(a)(1). In 1979, the Agency also developed a background information document (BID) to characterize "source categories" of facilities that emit radionuclides into ambient air, and in 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID. On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings, establishing an emission standard of 20 picocuries per square meter per second (pCi/(m^2-sec)) for radon (Rn)-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. Between 1984 and 1986, the Environmental Defense Fund (EDF), the Natural Resources Defense Council (NRDC), the Sierra Club (SC), and the American Mining Congress (AMC) filed various court petitions seeking modifications to the NESHAPs.

In a separate decision, the U.S. District Court for the District of Columbia outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk, and then considering additional factors, such as costs to establish the "ample margin of safety."

Section 112(q)(1) of the 1990 CAA Amendments requires that certain emission standards shall be reviewed, and if appropriate, revised to comply with the requirements of section 112(d). Subpart W is under review/revision in response to that requirement. Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. In accordance with section 112(d), the Administrator has

elected to promulgate standards that provide for the use of GACT or management practices to regulate radon emissions from uranium recovery facility tailings impoundments noted in Subpart W.

1.2 The Uranium Extraction Industry Today

From 1960 to the mid-1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. In the early years, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. Because of overproduction, the price of uranium rapidly declined in the 1980s. The declining uranium market could not support the existing number of uranium recovery operations, and many of the uranium recovery facilities in the United States were closed, decommissioned, and reclaimed. In the mid- to late 1980s, several uranium recovery projects employing the solution, or ISL, mining process came on line. However, because of a need for clean energy, a need to develop domestic sources of energy, and other reasons, current forecasts predict growth in the U.S. uranium recovery industry over the next decade and continuing into the future.

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. Representative of the extent of the conventional uranium milling operations that currently exist and are licensed in the United States are the mills at Sweetwater, Wyoming; Shootaring Canyon, Utah; and White Mesa, Utah. Only the White Mesa mill is currently in operation. A conventional mill at Piñon Ridge, Colorado, is currently in the planning and licensing stage. Additionally, a total of six potentially new conventional mill facilities are being discussed in New Mexico, Wyoming, Utah, and Arizona.

The radon data for the conventional mill tailings impoundments indicate that the radon exhalation rates from the surfaces are generally within the Subpart W standard of 20 pCi/(m^2-sec), but occasionally the standard may be exceeded. When that occurs, the tailings are usually covered with more soil, and the radon flux is reduced.

Solution, or ISL, mining is defined as the leaching or recovery of uranium from the host rock by chemicals, followed by recovery of uranium at the surface. ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects in the 1980s demonstrated solution mining to be a viable uranium recovery technique. Ten ISL facilities are currently operating (see Table 8, page 33), and about 23 other facilities are restarting, expanding, or planning for new operations.

Uranium is leached into solution through the injection into the ore body of a lixiviant. A lixiviant is a chemical solution used to selectively extract (or leach) uranium from ore bodies where they are normally found underground. The injection of a lixiviant essentially reverses the geochemical reactions that are associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. The liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. Since radium (Ra)-226 is present in the liquid bled from the lixiviant, radon will be generated in and released from the ISL's evaporation/holding ponds/ impoundments. The amount of radon released from these evaporation/holding ponds has been estimated and found to be small. (See Section 3.3.1.)

Heap leaching is a process by which chemicals are used to extract the economic element (for the purposes of Subpart W, uranium) from the ore. A large area of land is leveled with a small gradient, and a liner and collection system are installed. Ore is extracted from a nearby surface or underground mine and placed in heaps atop the liner. A leaching agent (usually an acid) will then be sprayed on the ore. As the leaching agent percolates through the heap, the uranium is mobilized and enters the solution. The solution will flow to the bottom of the pile and then along the gradient into collecting pools, from which it will be pumped to an onsite processing plant. In the past, a few commercial heap leach facilities operated but none is now operating. Planning and engineering have been undertaken for two heap leach facilities, one in Wyoming and the other in New Mexico.

A brief review of Method 115, "Monitoring for Radon-222 Emissions" (40 CFR 61, Appendix B) (SC&A 2008), demonstrated that its use can still be considered current for monitoring radon flux from conventional uranium tailings impoundments. It is not an option for measuring radon emissions from evaporation or holding ponds because there is no solid surface on which to place the monitors.

1.3 Current Understanding of Radon Risk

A description of how the understanding of the risk presented by radon and its progeny has evolved since the 1989 BID was published examines three parameters: (1) the radon progeny equilibrium fraction, (2) the epidemiological risk coefficients, and (3) the dosimetric risk coefficients. Additionally, SC&A (2011) used the computer code CAP88 version 3.0 (Clean Air Act Assessment Package-1988) to analyze the radon risk from eight operating uranium recovery sites, plus two generic sites.

The lifetime (i.e., 70-year) maximum individual risk (MIR)[1] calculated using data from eight actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments, while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments. (SC&A 2011)

To protect public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to a lifetime MIR of approximately 1 in 10 thousand (i.e., 10^{-4}). Although the calculated high end of the lifetime MIR range is above 10^{-4}, there are several mitigating factors. First, the highest MIR was calculated for a hypothetical mill at an eastern generic site. If an actual mill were to be located at the Eastern Generic site, it would be required to reduce its radon

[1] In this BID all risks are presented as mortality risks. If it is desired to estimate the morbidity risk, simply multiply the mortality risk by 1.39.

emissions as part of its licensing commitments. Also, the assumptions that radon releases occur continuously for 70 years and that the same reasonably maximally exposed individual (RMEI) is exposed to those releases for the entire 70 years are very conservative.

Likewise, the risk assessment estimated that the risk to the population from all eight real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 kilometers (km) of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km (50 miles) was 0.0043, which was less than one case every 200 years, for existing impoundments and 0.014, or approximately one case every 70 years, for new impoundments.

1.4 Evaluation of Subpart W Requirements

EPA has determined that radon releases from uranium recovery facilities are HAPs, as defined by the CAA. Furthermore, no radionuclide (including radon) releases have met the CAA's definition of major sources, and thus radon releases from uranium recovery facilities are classified as area sources. (See Section 5.3.) Under section 112(d) of the CAA, the EPA Administrator may elect to promulgate standards or requirements applicable to area sources that provide for the use of GACTs or management practices to reduce emissions of HAPs. For the four source categories of radon releases from uranium recovery facilities, the Administrator has elected to promulgate GACTs as follows:

Conventional Impoundments – Constructed on or before December 15, 1989

GACT The flux standard of 20 pCi/(m^2-sec) contained in the current 40 CFR 61.252(a) will no longer be required; require that these conventional impoundments be operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Conventional Impoundments – Constructed after December 15, 1989

GACT Retain the standard that conventional impoundments be designed, constructed, and operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Nonconventional Impoundments – Where uranium byproduct material (i.e., tailings) are contained in ponds and covered by liquids

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restrictions, and require that during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

Heap Leach Piles

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), and require that the moisture content of the operating heap be maintained at or greater than 30 percent.

Additionally, the analyses provided in this BID support the following findings:

- Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.
- By requiring that conventional impoundments be designed, constructed, and operated to meet one of two 40 CFR 61.252(b) work practices (i.e., phased disposal and continuous disposal), adoption of an emission limit (e.g., 20 pCi/(m^2-sec)) is not necessary to protect public health.
- The requirement that conventional impoundments use either phased or continuous disposal technologies is appropriate to ensure that public health is protected with an ample margin of safety, and is consistent with section 112(d) of the 1990 CAA Amendments that require standards based on GACT.
- The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures/facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

1.5 Economic Impacts

The economic impact analysis to support any potential revision of the Subpart W NESHAP is presented in four distinct areas:

(1) A review and summary of the original 1989 economic assessment and supporting documents are provided.

(2) The baseline economic costs for development of new conventional mills, ISL facilities, and heap leach facilities are developed and presented.

(3) The anticipated costs to the industries versus the environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

(4) Finally, information is provided on the economic impacts to disadvantaged and tribal populations and on environmental justice.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For conventional mills, data from the proposed new mill at the Piñon Ridge project in Colorado were used. Data from two proposed new ISL facilities were used; the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14 to 15-year production period,

which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Table 1 summarizes the unit cost (dollars per pound) estimates for all four uranium recovery facilities. As shown, on a unit cost basis, heap leach facilities are projected to be the least expensive, and the two ISL facilities the most expensive.

Table 1: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC	w/o LoC
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87

Because the four proposed GACTs are not expected to change the manner in which any of the uranium recovery facilities are designed, built, or operated, no additional economic benefits or costs are associated with the proposed Subpart W revisions.

At 10 of the 15 existing or proposed uranium recovery sites analyzed, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is white exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either African-American or Other is less than the national norm, while the percentage of African-Americans and Others is less than the regional norm at all but one site. The analysis found that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are more economically advantaged (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the United States' 50th percentile. On the other hand, five sites are located in areas where the per capita nonfarm wealth is below the country's 10th percentile.

2.0 INTRODUCTION, HISTORY, AND BASIS

On December 15, 1989, EPA promulgated a NESHAP for radon emissions from operating uranium mill tailings (40 CFR 61, Subpart W). Section 112(q) of the CAA, as amended, requires EPA to review, and if appropriate, revise or update the Subpart W standard on a timely basis (within 10 years of passage of the CAA Amendments of 1990). Soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically. However, recent developments in the market for uranium have led to some companies expressing their intention to pursue licensing of new facilities, and therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations before these proposed facilities become operational.

Two separate standards are defined in Subpart W. The first states that existing sources (facilities constructed before December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) or 1.9 picocuries per square foot per second (pCi/(ft^2-sec)) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA showing the results of the compliance monitoring. The second Subpart W standard prescribes that for new sources (facilities constructed on or after December 15, 1989), no new tailings impoundment can be built unless it is designed, constructed, and operated to meet one of the two following work practices:

(1) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) as determined by the U.S. Nuclear Regulatory Commission (NRC). The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

(2) Continuous disposal of tailings such that tailings are dewatered and immediately disposed of with no more than 10 acres uncovered at any time and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The work practice standard also applies to operations at existing sources, once their existing impoundments can no longer accept additional tailings.

The facilities covered by Subpart W are uranium recovery facilities, also licensed and regulated by the NRC or its Agreement States. The NRC becomes involved in uranium recovery operations once the ore is processed and chemically altered. This occurs either in a uranium mill (the next step from a conventional mine) or during ISL or heap leach. For this reason, the NRC regulates ISL facilities, as well as uranium mills and the disposal of liquid and solid wastes from uranium recovery operations (including mill tailings), but does not regulate the conventional uranium mining process. The NRC regulations for the protection of the public and workers from exposure to radioactive materials are found in 10 CFR 20, while specific requirements for the design and operation of uranium mills and disposition of tailings are found in 10 CFR 40, Appendix A.

2.1 Document Contents and Structure

This report is divided into six sections. The first two sections are the Executive Summary and this introduction, which includes discussions of the history of the development of Subpart W (Section 2.2) and the basis for the 1989 risk assessments (Section 2.3). Four technical sections, the contents of which are summarized below, follow this introductory section.

2.1.1 The Uranium Extraction Industry Today

After a brief history of the uranium market, Section 3.0 identifies both the uranium recovery facilities that are licensed today and those that have been proposed to be built in the future.

For currently existing impoundments, Section 3.0 presents the following information:

- Data on the configuration of current impoundments.
- Results of compliance monitoring.

Section 3.0 also presents a description of the Method 115 radon monitoring method.

2.1.2 Current Understanding of Radon Risk

Section 4.0 presents a qualitative analysis of the changes that have occurred in the understanding of the risks associated with Rn-222 releases from impoundments. Emphasis is on the changes to the predicted radon progeny equilibrium fractions and the epidemiological and dosimetric lifetime fatal cancer risk per working level (WL). Section 4.0 also discusses how the current analytical computer model, CAP88 Version 3.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Finally, Section 4.4 presents dose and risk estimates for several current uranium recovery facilities.

2.1.3 Evaluation of Subpart W

The evaluation of Subpart W requirements required the analyses of some key issues to determine if the current technology has advanced since the 1989 promulgation of the rule. The key issues include: existing and proposed uranium recovery facilities, Resource Conservation and Recovery Act (RCRA) comparison, regulatory history, tailings impoundment technologies, radon measurement methods, and risk assessment. Section 5.0 discusses these key issues, in order to determine whether the requirements of Subpart W are necessary and sufficient.

Based on the evaluation of the key issues and in keeping with section 112(d) of the CAA, Section 5.0 also presents GACT radon emission control standards for three categories of uranium recovery facilities:

(1) Conventional impoundments.

(2) Nonconventional impoundments, where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids.

(3) Heap leach piles.

In addition to the key issues, several issues that need clarification in order to be more fully understood are presented and described. The issues in need of clarification include extending monitoring requirements, defining when the closure period for an operating facility begins, interpretation of the term “standby,” the role of weather events, and monitoring reporting requirements.

2.1.4 Economic Impact Analysis

Section 6.0 of the document reviews and reassesses all the additional economic impacts that may occur due to the extension and revision of the Subpart W NESHAP and specifically addresses the following:

- A review and summary of the original 1989 economic assessment and supporting documents are provided.

- The baseline economic costs for the development of new conventional mills and ISL and heap leach facilities are developed and presented.

- The anticipated costs to industries versus environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

- Finally, information is provided relating to economic impacts on disadvantaged populations and tribal populations and to environmental justice.

2.2 History of the Development of the Subpart W NESHAP

The following subsections present a brief history of the development of environmental radiation protection standards by EPA, with particular emphasis on the development of radionuclide NESHAPs.

Table 2 presents a partial time line sequence of EPA's radiation standards with emphasis on the NESHAPs, including Subpart W.

Table 2: Partial Timeline of EPA's Radiation Standards

January 13, 1977	EPA publishes 40 CFR 190 – Environmental Protection Standards for Nuclear Power Operations.
August 1979	EPA publishes first BID, *Radiological Impacts Caused by Emission of Radionuclides into Air in the United States*, EPA 520/7-79-006.
December 27, 1979	EPA determines radionuclides constitute a HAP – (section 112(a)(1) amendments to the CAA.
January 5, 1983	EPA under UMTRCA promulgates, 40 CFR 192, Subpart B "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites," that for inactive tailings or after closure of active tailings, the radon flux should not exceed an average release rate of 20 pCi/(m^2-sec).
March 1983	EPA publishes draft report, *Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-83-001, and proposes radionuclide NESHAPs for: 1. DOE and Non-NRC-Licensed Federal Facilities. 2. NRC-Licensed Facilities. 3. Elemental Phosphorus Plants. 4. Underground Uranium Mines.
September 30, 1983	EPA issues standards under UMTRCA (40 CFR 192, Subparts D and E) for the management of tailings at locations licensed by the NRC or the States under Title II of the UMTRCA. These standards do not specifically limit Rn-222 emissions until after closure of a facility; however, they require ALARA procedures for Rn-222 control.
February 17, 1984	SC sues EPA (District Court for Northern California) and demands EPA promulgate final NESHAP rules for radionuclides or find that they do not constitute a HAP (i.e., "de-list"" the pollutant). In August 1984, the court grants the SC motion and orders EPA to take final actions on radionuclides by October 23, 1984.
October 22, 1984	EPA issues *Final Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-84-022-1and -2.
October 23, 1984	EPA withdraws the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities.

Table 2: Partial Timeline of EPA's Radiation Standards

December 1984	District Court finds EPA in contempt. EPA and SC submit motion to court with schedule (August 5, 1985). Court orders EPA to issue final standards for Rn-222 emissions from licensed uranium mills and mill tailings impoundments by May 1, 1986 (later moved to August 15, 1986).
February 6, 1985, to September 24, 1986	EPA promulgates NESHAPs for: 1. DOE Facilities (February 1985). 2. NRC-Licensed Facilities and Non-DOE Federal Facilities (February 1985). 3. Elemental Phosphorus Plants (February 1985). 4. On April 17, 1985, Rn-222 emissions from underground uranium mines added. 5. On September 24, 1986, Rn-222 from licensed uranium mill tailings added – 20 pCi/(m^2-sec) and the work practice standard for small impoundments or continuous disposal.
November 1986	AMC and EDF file petitions challenging the NESHAPs for operating uranium mills.
July 28, 1987	The Court of Appeals for the District of Columbia remanded to EPA the NESHAP for vinyl chloride (see text). Given the decision, EPA petitioned the court for a voluntary remand of standards and asked that the pending litigation on all issues relating to its radionuclide NESHAPs be placed in abeyance during the rulemaking. EPA also agreed to reexamine all issues raised by parties to the litigation. The court granted EPA's petition on December 8, 1987.
September 14, 1989	EPA promulgates NESHAPs for benzene, etc. Importantly, EPA establishes the "fuzzy bright line." That is, EPA's approach to residual risk under section 112 (as advanced in the Hazardous Organic NESHAPs and approved by the District of Columbia Circuit in *NRDC v. EPA*) as essentially establishing a "fuzzy bright line" with respect to carcinogens, whereby EPA must eliminate risks above one hundred in one million (1 in 10,000) , does not have to address risks below one in one million (1 in 1,000,000), and has discretion to set a residual risk standard somewhere in between (Jackson 2009). In a second step, EPA can consider whether providing the public with "an ample margin of safety" requires risks to be reduced further than this "safe" level, based on EPA's consideration of health information and other factors such as cost, economic impact, and technological feasibility (Jackson 2009).
September 1989	EPA publishes the NESHAPs for radionuclides. The agency prepared an EIS in support of the rulemaking. The EIS consisted of three volumes: Volume I, *Risk Assessment Methodology*; Volume II, *Risk Assessments*; and Volume III, *Economic Assessment.*
December 15, 1989	EPA promulgates NESHAPs for: • Subpart B: National Emission Standards for Radon Emissions from Underground Uranium Mines. • Subpart H: Emissions of Radionuclides Other than Radon from DOE Facilities. • Subpart I: National Emissions of Radionuclides Other than Radon from DOE Facilities by NRC and Federal Facilities Not Covered by Subpart H. • Subpart K: Radionuclide Emissions from Elemental Phosphorus Plants. • Subpart Q: Radon Emissions from DOE Facilities. • Subpart R: Radon Emissions from Phosphogypsum Stacks. • Subpart T: Radon Emissions from the Disposal of Uranium Mill Tailings. (rescinded effective June 29, 1994; published in the FR July 15, 1994). • Subpart W: Radon Emissions from Operating Uranium Mill Tailings Piles.
November 15, 1990	President signs the CAA Amendments of 1990. Part of the act requires that some regulations passed before 1990 be reviewed and, if appropriate, revised within 10 years of the date of enactment of the CAA Amendments of 1990. The amendments also instituted a technology-based framework for HAPs. Sources that are defined as large emitters are to employ MACT, while sources that emit lesser quantities may be controlled using GACT.

2.2.1 The 1977 Amendments to the Clean Air Act

On January 13, 1977 (FR 1977), EPA established environmental protection standards for nuclear power operations pursuant to its authority under the Atomic Energy Act (AEA). The standards in 40 CFR 190, which covered all licensed facilities that are part of the uranium fuel cycle, established an annual limit on exposure to members of the public. The NRC or its Agreement States, which licenses these facilities, has the responsibility for the enforcement of the Part 190 standards. Additionally, the NRC imposes the requirement that licensees keep all exposures "as low as reasonably achievable" (ALARA). The Part 190 standards exempted Rn-222 from the annual limit because of the uncertainties associated with the risk of inhaled radon.

After the promulgation of 40 CFR 190, the 1977 amendments to the CAA were passed. These amendments included the requirement that the Administrator of EPA determine whether radionuclides should be regulated under the CAA.

In December 1979, the Agency published its determination in the *Federal Register* (FR 1979) that radionuclides constitute a HAP within the meaning of section 112(a)(1). As stated in the FR, radionuclides are known to cause cancer and genetic defects and to contribute to air pollution that may be anticipated to result in an increase in mortalities or an increase in serious, irreversible, or incapacitating reversible illnesses. The Agency further determined that the risks posed by emissions of radionuclides into the ambient air warranted regulation and listed radionuclides as a HAP under section 112.

Section 112(b)(1)(B) of the CAA requires the Administrator to establish NESHAPs at a "level which (in the judgment of the Administrator) provides an ample margin of safety to protect the public health" or find that they are not hazardous and delist them.

2.2.2 Regulatory Activities between 1979 and 1987

To support the development of radionuclide NESHAPs, the Agency developed a BID to characterize "source categories" of facilities that emit radionuclides into ambient air (EPA 1979). For each source category, EPA developed information needed to characterize the exposure of the public. This included characterization of the facilities in the source category (numbers, locations, proximity of nearby individuals); radiological source terms (curies/year (Ci/yr)) by radionuclide, solubility class, and particle size; release point data (stack height, volumetric flow, area size); and effluent controls (type, efficiency). Doses to nearby individuals and regional populations caused by releases from either actual or model facilities were estimated using computer codes (see Section 2.3).

In 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID (EPA 1983). These four source categories were the Department of Energy (DOE) and non-NRC-licensed federal facilities, NRC-licensed facilities, elemental phosphorus plants, and underground uranium mines. For all other source categories considered in the BID (i.e., coal-fired boilers, the phosphate industry and other extraction industries, uranium fuel-cycle facilities, uranium mill tailings, high-level waste disposal, and low-energy accelerators), the Agency found that NESHAPs were not necessary. In reaching this conclusion, the Agency found that either the levels of radionuclide emissions did not cause a significant dose to nearby

individuals or the regional populations, the additional effluent controls were not cost effective, or the existing regulations under other authorities were sufficient to keep emissions at an acceptable level.

During the public comment period on the proposed NESHAPs, the Agency completed its rulemaking efforts under the Uranium Mill Tailings Remedial Control Act (UMTRCA) to establish standards (40 CFR 192) for the disposal of uranium mill tailings. With respect to the emission of Rn-222, the UMTRCA standards established a design standard calling for an Rn-222 flux rate of no more than 20 pCi/(m^2-sec).

In February 1984, the SC sued EPA in the U.S. District Court for Northern California (*Sierra Club v. Ruckelshaus*, No. 84-0656) (EPA 1989), demanding that the Agency promulgate final NESHAPs or delist radionuclides as a HAP. The court sided with the plaintiffs and ordered EPA to promulgate final regulations. In October 1984, EPA withdrew the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities, finding that existing control practices protected the public health with an ample margin of safety (FR 1984). EPA also withdrew the NESHAP for underground uranium mines, but stated its intention to promulgate a different standard and published an Advance Notice of Proposed Rulemaking (ANPR) to solicit additional information on control methods. It also published an ANPR for licensed uranium mills. Finally, the FR notice affirmed the decision not to regulate the other source categories identified in the proposed rule, with the exception that EPA was doing further studies of phosphogypsum stacks to see if a standard was needed.

In December 1984, the U.S. District Court for Northern California found EPA's action of withdrawing the NESHAPs to be in contempt of the court's order. Given the ruling, the Agency issued the final BID (EPA 1984) and promulgated final standards for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities in February 1985 (FR 1985a), and a work practice standard for underground uranium mines in April of the same year (FR 1985b).

The EDF, the NRDC, and the SC filed court petitions seeking review of the October 1984 final decision not to regulate the source categories identified above, the February 1985 NESHAPs, and the April 1985 NESHAP. The AMC also filed a petition seeking judicial review of the NESHAP for underground uranium mines.

On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings (FR September 24, 1986), which established an emission standard of 20 pCi/(m^2-sec) for Rn-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. One justifications for the work practices was that, while large impoundments did not pose an unacceptable risk during active operations, the cyclical nature of the uranium milling industry could lead to prolonged periods of plant standby and the risk that the tailings impoundments could experience significant drying, with a resulting increase in Rn-222 emissions. Furthermore, the Agency believed that the two acceptable work practices actually saved the industry from the significant costs of constructing and closing large impoundments before they were completely filled. With the promulgation of the NESHAP for operating uranium mill tailings, three EPA regulations covered the releases of radionuclides into

the air during operations and tailings disposal at uranium mills: 40 CFR 190; 40 CFR 192; and 40 CFR 61, Subpart W.

In November 1986, the AMC and the EDF filed petitions challenging the NESHAP for operating uranium mill tailings.

2.2.3 Regulatory Activities between 1987 and 1989

While the petitions filed by the EDF, NRDC, SC, and AMC were still before the courts, the U.S. District Court for the District of Columbia, in *NRDC v. EPA* (FR 1989b), found that the Administrator had impermissibly considered costs and technological feasibility in promulgating the NESHAP for vinyl chloride. The court outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk and then considering additional factors, such as costs, to establish the "ample margin of safety." Given the court's decision, the Agency reviewed how it had conducted all of its NESHAP rulemakings and requested that the court grant it a voluntary remand for its radionuclide NESHAPs. As part of an agreement with the court and the NRDC, the Agency agreed to reconsider all issues that were currently being litigated, and it agreed that it would explicitly consider the need for a NESHAP for two additional source categories: radon from phosphogypsum stacks and radon from DOE facilities. The subsequent reconsideration became known as the radionuclide NESHAPs reconsideration rulemaking.

2.2.4 1989 Radionuclide NESHAPs Reconsideration Rulemaking

In the radionuclide NESHAPs reconsideration rulemaking, the Administrator relied on a "bright line" approach for determining whether a source category required a NESHAP. This meant that no NESHAP was required if all individuals exposed to the radionuclide emissions from the facilities in the source category were at a lifetime cancer risk of less than 1 in 1,000,000, and less than 1 fatal cancer per year was estimated to be incurred in the population. For source categories that did not meet this "bright line" exclusion, the Agency adopted a two-step, multi-factor approach to setting the emission standards.

The first step established a presumptively acceptable emissions level corresponding to an MIR of about 1 in 10,000 lifetime cancer risk, with the vast majority of exposed individuals at a lifetime risk lower than 1 in 1,000,000, and with less than 1 total fatal cancer per year in the exposed population. If the baseline emissions from a source category met these criteria, they were presumed adequately safe. If they did not meet these criteria, then the Administrator was compelled by his nondiscretionary duty to determine an emission limit that would correspond to risks that were adequately safe.

After baseline emissions were determined to be adequately safe or an adequately safe alternative limit defined, the analysis moved to the second step, where reduced risks for alternative emission limits were evaluated, along with the technological feasibility and costs estimated to be associated with reaching lower levels. In the two-step approach, the Administrator retained the discretion to decide whether the NESHAP should be set at these lower limits.

2.2.5 1990 Amendments to the Clean Air Act

NESHAP Subpart W is under consideration for revision because section 112(q)(1) requires that certain emission standards in effect before the date of enactment of the 1990 CAA Amendments shall be reviewed and, if appropriate, revised to comply with the requirements of section 112(d). As stated previously, soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically, negating the need to perform the Subpart W review. However, as discussed in Section 3.1, recent developments in the market for uranium have led to forecasts of growth in the uranium market over the next decade and continuing for the foreseeable future. Therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations at this time, before facilities developed in response to those forecasts become operational.

Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. Section 112(c) lists radionuclides, including radon, as an HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for the regulation of emissions of HAPs.

The regulation of HAPs at major sources is dictated by the use of maximum achievable control technology (MACT). Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating an MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

EPA has determined that radon emissions from uranium recovery facility tailings impoundments are an area source and that GACT applies (see Section 5.3). The Senate report on the legislation (U.S. Senate 1989) contains additional information on GACT and describes GACT as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.*

Determining what constitutes a GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. It is also necessary to consider the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are considered to determine whether such technologies and practices could be generally available for the area source category at issue. Finally, as noted above, in determining GACTs for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

2.3 Basis for the Subpart W 1989 Risk Assessment and Results

In the 1989 NESHAP for operating uranium mill tailings, exposures and risks were estimated using a combination of actual site data for existing impoundments and model or representative facilities for future impoundments and computer models. The 1989 risk assessment reflected the estimated risks to the regional (0-80 km [0-50 mile]) populations associated with the 11 conventional mills that were operating or in standby[2] at that time. Mathematical models were developed to simulate the transport of radon released from the mill tailings impoundments and the exposures and risks to individuals and populations living near the mills. Those models were programmed into three computer programs for the 1989 risk assessment: AIRDOS-EPA, RADRISK, and DARTAB. The paragraphs that follow briefly discuss each of these computer programs.

AIRDOS-EPA was used to calculate radionuclide concentrations in the air, rates of deposition on the ground, concentrations on the ground, and the amounts of radionuclides taken into the body via the inhalation of air and ingestion of meat, milk, and vegetables. A Gaussian plume model was used to predict the atmospheric dispersion of radionuclides released from multiple stacks or area sources. The amounts of radionuclides that are inhaled were calculated from the predicted air concentrations and a user-specified breathing rate. The amounts of radionuclides in the meat, milk, and vegetables that people ingest were calculated by coupling the atmospheric transport models with models that predict the concentration in the terrestrial food chain.

RADRISK computed dose rates to organs resulting from a given quantity of radionuclide that is ingested or inhaled. Those dose rates were then used to calculate the risk of fatal cancers in an exposed cohort of 100,000 persons. All persons in the cohort were assumed to be born at the same time and to be at risk of dying from competing causes (including natural background radiation). RADRISK tabulated estimates of potential health risk due to exposure to a known quantity of approximately 500 different radionuclides and stored these estimates until needed. These risks were summarized in terms of the probability of premature death for a member of the cohort due to a given quantity of each radionuclide that is ingested or inhaled.

DARTAB provided estimates of the impact of radionuclide emissions from a specific facility by combining the information on the amounts of radionuclides that were ingested or inhaled (as provided by AIRDOS-EPA) with dosimetric and health effects data for a given quantity of each radionuclide (as provided by RADRISK). The DARTAB code calculated dose and risk for individuals at user-selected locations and for the population within an 80-km radius of the source. Radiation doses and risks could be broken down by radionuclide, exposure pathway, and organ.

Of the 11 conventional mills that were operating or in standby at that time, seven had unlined impoundments (the impoundments were clay lined, but not equipped with synthetic liners), while five had impoundments with synthetic liners. As the NESHAP revoked the exemption to the liner requirement of 40 CFR 192.32(a), the mills with unlined impoundments had to close the

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[2] "Standby" means the period of time when a facility may not be accepting new tailings but has not yet entered closure operations.

impoundments and move towards final reclamation and long-term stabilization of the tailings impoundments.

2.3.1 Existing Impoundments

The NESHAP for operating uranium mill tailings addressed both existing and future tailings impoundments. For the existing impoundments, the radon emissions and estimated risks were developed using site-specific data for each of the 11 mills that were operating or in standby at the time the assessment was made. These data included the average Ra-226 content of the tailings, the overall dimensions and areas of the impoundments (developed from licensing data and aerial photographs), areas of dry (unsaturated) tailings, the existing populations within 5 km of the centers of the impoundments (identified by field enumeration), 5–80 km populations derived from U.S. Census tract data, meteorological data (joint frequency distributions) from nearby weather stations, mixing heights, and annual precipitation rates.

The AIRDOS-EPA code was used to estimate airborne concentrations based on the calculated Rn-222 source term for each facility. Rn-222 source terms were estimated on the assumption that an Rn-222 flux of 1 pCi/(m^2-sec) results for each 1 picocurie per gram (pCi/g) of Ra-226 in the tailings and the areas of dried tailings at each site. The radon flux rate of 1 pCi/(m^2-sec) per pCi/g Ra-226 was derived based on theoretical radon diffusion equations and on the lack of available radon emissions measurements.

For each sector in the 0–80 km grid around each facility, the estimated Rn-222 airborne concentration was converted to cumulative working level months (WLMs), assuming a 0.50 equilibrium fraction between radon and its decay products, an average respiration rate appropriate for members of the general public, and the assumption of continuous exposure over a 70-year lifetime. Using a risk coefficient of 760 fatalities/10^6 WLM, lifetime risk, fatal cancers per year, and the risk distribution were calculated for the exposed population.

The baseline risk assessment for existing uranium tailings showed an MIR of 3×10^{-5} which was below the benchmark level of approximately 1×10^{-4} and is, therefore, presumptively safe. Additionally, the risk assessment calculated 0.0043 annual fatal cancers in the 2 million persons living within 80 km of the mills. The distribution of the cancer risk showed that 240 persons were at risks between 1×10^{-5} and 1×10^{-4}, and 60,000 were at risks between 1×10^{-6} and 1×10^{-5}. The remainder of the population of about 2 million was at a risk of less than 1×10^{-6}. Based on these findings, EPA concluded that baseline risks were acceptable.

The decision on an ample margin of safety considered all of the risk data presented above plus costs, scientific uncertainty, and the technical feasibility of control technology necessary to lower emissions from operating uranium mill tailings piles. As the risks from existing emissions were very low, EPA determined that an emission standard of 20 pCi/(m^2-sec), which represented current emissions, was all that was necessary to provide an ample margin of safety. The necessity for the standard was explained by the need to ensure that mills continued the current control practice of keeping tailings wet and/or covered. Finally, to ensure that ground water was not adversely affected by continued operation of existing piles that were not synthetically lined

or clay lined, the NESHAP ended the exemption to the requirements of 40 CFR 192.32(a), which protects water supplies from contamination.

2.3.2 New Impoundments

The 1989 risk assessment for new mill tailings impoundments was based on a set of model mills, defined so that the impact of alternative disposal strategies could be evaluated. For the purpose of estimating the risks, the model mills were characterized to reflect operating mills, and the dispersion modeling and population exposures were based on the arid conditions and sparse population density that characterize existing impoundments in the southwestern states.

For new impoundments, a baseline consisting of one large impoundment (116 acres, which is 80% wet or ponded during its 15-year active life) was modeled (i.e., the continuation of the current practice). The baseline results indicated an MIR of 1.6×10^{-4}, a fatal cancer incidence of 0.014 per year, and only 20 persons at a risk greater than 1×10^{-4}. Given the numerous uncertainties in establishing the parameters for the risk assessment and in modeling actual emissions and exposures, the Administrator found that the baseline emissions for new tailings impoundments met the criteria for presumptively safe.

The decision on an ample margin of safety for new tailings considered two alternatives to the baseline of one large impoundment: phased disposal using a series of small impoundments and continuous disposal. The evaluation of these alternatives showed a modest reduction in the MIR and the number of fatal cancers per year, but a significant increase in the number of individuals at a lifetime risk of less than 1×10^{-6}. The costs estimated for the two alternatives showed that phased disposal would lead to an incremental cost of $6.3 million, while continuous disposal was believed to actually result in a modest cost saving of $1 million.

Given the large uncertainties associated with the risk and economic assessments performed for the new tailings impoundments, and considering the boom and bust cycles that the uranium industry has experienced, EPA determined that a work practice standard was necessary to prevent the risks from increasing if an impoundment were allowed to become dry. Finally, although continuous disposal showed slightly lower overall risks and costs than phased disposal, the Administrator recognized that it was not a proven technology for disposal of uranium mills tailings. Therefore, he determined that the work practice standard should allow for either phased disposal (limited to 40-acre impoundments, with a maximum of two impoundments open at any one time) or continuous disposal.

3.0 THE URANIUM EXTRACTION INDUSTRY TODAY: A SUMMARY OF THE EXISTING AND PLANNED URANIUM RECOVERY PROJECTS

Section 3.1 describes the historical uranium market in the United States. In the 1950s and 1960s, the market was dominated by the U.S. government's need for uranium, after which the commercial nuclear power industry began to control the market. The next three sections describe the types of process facilities that were and continue to be used to recover uranium. Section 3.2 describes conventional mills and includes descriptions of several existing mines, while Section 3.3 describes ISL facilities. Heap leach facilities are described in Section 3.4. Finally,

Section 3.5 discusses the applicability of the Subpart W recommended radon flux monitoring method.

3.1 The Uranium Market

The uranium recovery industry in the United States is primarily located in the arid southwest. From 1960 to the mid 1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. The majority of the uranium production at that time was associated with defense needs, while a lesser amount was associated with commercial power reactor needs. Without exception, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. The conventional uranium mining/milling process is described in Section 3.2.

When the demand for uranium could not support the existing number of uranium recovery operations, there was a movement to decommission and reclaim much of the uranium recovery industry in the United States.

The UMTRCA Title I program established a joint federal/state-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet standards set by EPA.

The UMTRCA Title II program is directed toward uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the act provides –

- NRC authority to control radiological and nonradiological hazards.
- EPA authority to set generally applicable standards for both radiological and nonradiological hazards.
- Eventual state or federal ownership of the disposal sites, under general license from NRC.[3]

In the mid- to late 1980s, several commercial uranium recovery projects employing the solution, or ISL, mining process came on line. Section 3.3 describes the uranium ISL mining process. The uranium ISL projects and the data that they collected served as the industry standard. This industry saw an increase in activity as the conventional mine/milling operations were being shut down.

This shift in the method of uranium mining was associated with economic conditions that existed at the time. The price of uranium rapidly declined in the 1980s. The decline in price was associated with overproduction that took place during the earlier years. The peak in production was associated with Cold War production and associated contracts with DOE. However, as the

[3] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/mill-tailings.html

Cold War came to an end, the need for uranium began to diminish. The amount of uranium that was needed for DOE projects was greatly diminished and, therefore, the price of uranium saw a decline. Figure 1 shows the spot prices for natural uranium. Note the price decline in the early 1980s.

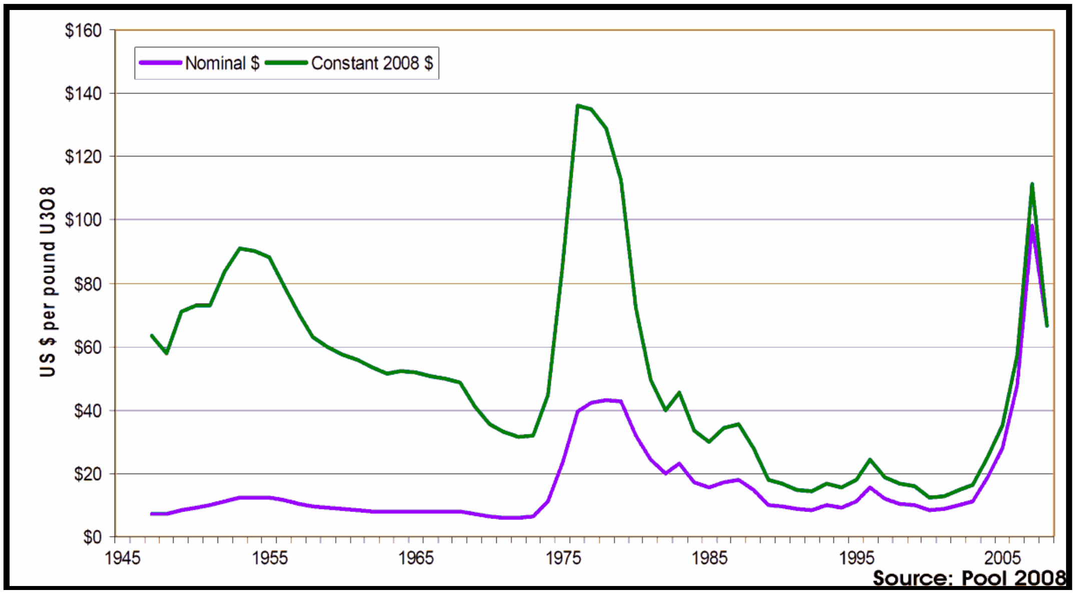
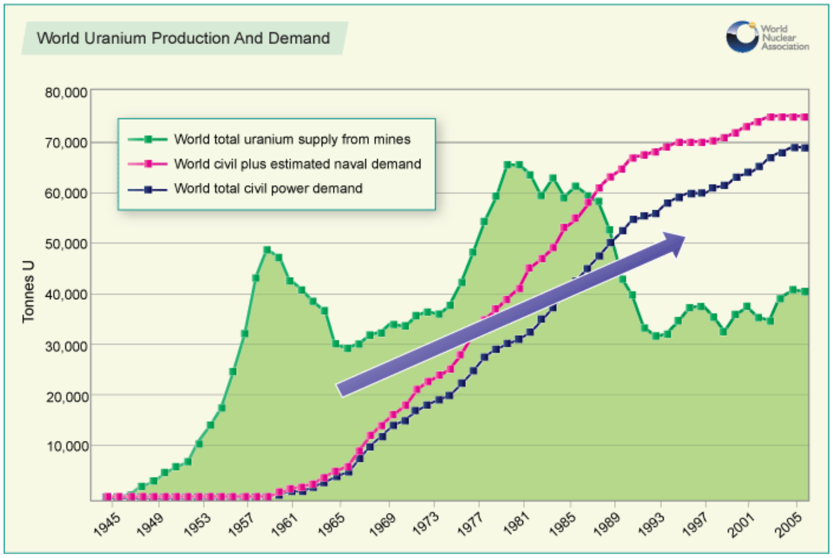


Figure 1: Historical Uranium Prices

Additionally, inexpensive uranium appeared on the worldwide market associated with the foreign supplies of low-grade and rather impure yellowcake. Only minimal purification and associated refinement was necessary to produce a yellowcake feedstock that could supply domestic and worldwide uranium needs from the low-grade foreign supply. Finally, the megatons to megawatts downblending program also supplied large supplies of uranium, both domestically and worldwide. Classical supply and demand economic principles established a market that had oversupply, constant demand and, therefore, a declining price. Consequently, the uranium industry in the United States saw a production decline. Although the number of uranium operations and production of domestic supply of uranium declined, several domestic uranium projects remained active, primarily supplying foreign uranium needs. These projects were generally located in the ISL mining production states of Nebraska, Texas, and Wyoming. This represented a significant shift in the method that was used to recover uranium, from conventional mines to ISL mines.

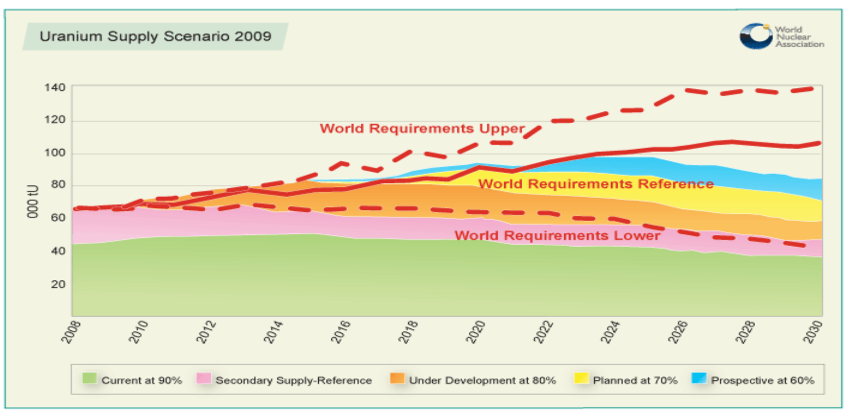
Numerous forecasts of worldwide uranium supply and demand exist. Perhaps one of the best graphical representations is from the World Nuclear Association. Figure 2 shows the actual uranium production rates from 1945 to 2005, as well as the demand trend that was established based on these production numbers. Figure 2 indicates that, from the 1960s to the present, the worldwide uranium demand has continued to increase even though the U.S. price for uranium has decreased.



Source: WNA 2010

Figure 2: Uranium Production and Demand from 1945 to 2005

Figure 3 shows the uranium supply scenario forecast by the World Nuclear Association. The three potential requirement curves shown are based on a variety of factors. The figure indicates that current production, as well as planned future worldwide production, may begin to fall short of demand in the next few years.



Source: WNA 2010

Figure 3: Uranium Supply Scenario from 2008 to 2030

In summary, all forecasts are for the uranium industry to show growth in the next decade and continuing for the foreseeable future. Drivers for this trend are a worldwide need for clean energy resources, the current trend to develop domestic sources of energy, and the investment of foreign capital in the United States, which is recognized as a politically and economically stable market in which to conduct business.

3.2 Conventional Uranium Mining and Milling Operations

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. There are currently no licensed heap leach facilities. Conventional uranium mining and milling operations are in the minority and are a carryover from the heavy production days of the 1970s and 1980s. Sweetwater Mill, Shootaring Canyon Mill, and White Mesa Mill represent the extent of the current conventional uranium milling operations that exist in the United States.

A conventional uranium mill is generally defined as a chemical plant that extracts uranium using the following process:

(1) Trucks deliver uranium ore to the mill, where it is crushed into smaller particles before the uranium is extracted (or leached). In most cases, sulfuric acid (H_2SO_4) is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. In addition to extracting 90–95% of the uranium from the ore, the leaching agent also extracts several other "heavy metal" constituents, including molybdenum, vanadium, selenium, iron, lead, and arsenic.

(2) The mill then concentrates the extracted uranium to produce a material called "yellowcake" because of its yellowish color.

(3) Finally, the yellowcake is transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 4 shows a schematic of a typical conventional uranium mill.

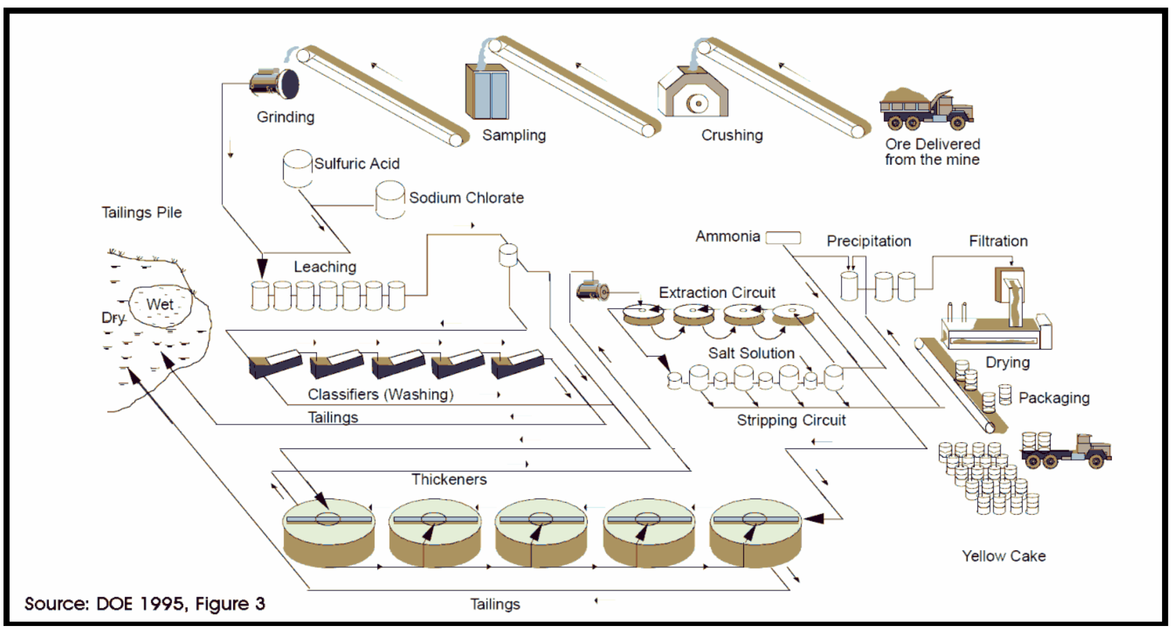


Figure 4: Typical Conventional Uranium Mill

Currently, there are three domestic licensed conventional uranium mining and milling facilities and a newly licensed facility that has yet to be constructed, as shown in Table 3.

Table 3: Conventional Uranium Mining and Milling Operations

Mill Name	Licensee	Location	Website
Sweetwater	Kennecott Uranium Co/Wyoming Coal Resource Co	Sweetwater County, Wyoming	None identified
Shootaring Canyon	Uranium One Americas	Garfield County, Utah	http://www.uranium1.com/ indexu.php?section=home
White Mesa	EFR White Mesa LLC	San Juan County, Utah	http://www.energyfuels.com/ white_mesa_mill/
Piñon Ridge	Energy Fuels Resources Corp.	Montrose County, Colorado	http://www.energyfuels.com/ projects/pinon-ridge/index.html
Mill Name	**Regulatory Status**		**Capacity (tons/day)**
Sweetwater	Standby,* license expires November 2014		3,000
Shootaring Canyon	Standby,* license expires May 2012		750
White Mesa	Operating, license expires March 2015		2,000
Piñon Ridge	Development, license issued January 2011		500 (design)

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

Instead of processing uranium ore, the conventional mills shown in Table 3 may process alternate feed stocks. These feed stocks are generally not typical ore, but rather materials that contain recoverable amounts of radionuclides, rare earths, and other strategic metals. These feed stocks are processed, the target materials are recovered, and the waste tailings are discharged to the tailings impoundment. The two facilities shown in Table 3 as being in standby (Sweetwater and Shootaring Canyon) have had their operating licenses converted into "possession only" licenses. Prior to recommencing operation, those facilities will be required to submit a license application to convert back to an operating license. EPA will review that portion of the license application associated with NESHAP to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures.

As described in Section 3.1, the rapid rise in energy costs, increased concerns about global warming, and the tremendous worldwide surge in energy use have all led to renewed interest in uranium as an energy resource. At the spring 2010 joint National Mining Association (NMA)/ NRC Uranium Recovery Workshop, the NRC identified numerous projects that have filed or are expected to file applications for new licenses, expansions of existing operations, or restarts of existing operations, including several proposals for conventional uranium recovery facilities. Contacts with the NRC and state regulatory agencies indicate that permitting and licensing actions are associated with the proposed conventional uranium milling and processing projects shown in Table 4. Although a significant uranium producer, at present, Texas has no interest in conventional uranium milling operations. The potential new mill at Piñon Ridge, Colorado, is not shown in Table 4, since its development is advanced and it has already been listed in Table 3.

Table 4: Proposed New Conventional Uranium Milling Facilities

Company	Site	(Estimated) Application Date	State
Uranium Energy Corp	Anderson Project	N.A.	AZ
Rio Grande Resources	Mt. Taylor	FY14	NM
Strathmore Minerals Corporation	Roca Honda	12-Sep	NM
Uranium Resources, Inc.	Juan Tafoya	FY 14	NM
Oregon Energy, LLC	Aurora Uranium Project	13-Dec	OR
Virginia Uranium	Coles Hills	N.A.	VA
Strathmore Minerals Corporation	Gas Hills	12-Sep	WY

N.A. = not available

No new construction has taken place on any milling facilities shown in Table 4; however, as with all industries, planning precedes construction. Considerable planning is underway for existing and new uranium recovery operations. As with facilities currently in standby, EPA will review the license application to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures for these proposed new mills.

No specific information is available on the type of tailings management systems intended for the proposed new conventional mills. To limit radon that could be emitted from the tailings impoundments, Subpart W requires that the tailings be disposed of in a phased disposal system with disposal cells not larger than 40 acres, or by continuous disposal in which not more than 10 acres of exposed tailings may accumulate at any time. Regardless of the type of tailings management system the new milling operations select, they will all also have to demonstrate that their proposed tailings impoundment systems meet the requirements in 40 CFR 192.32(a)(1).

3.2.1 Sweetwater Mill, Kennecott Mining Company, Red Desert, Wyoming

The Sweetwater project is a conventional uranium recovery facility located about 42 mi northwest of Rawlins, Wyoming, in Sweetwater County. The site is very remote and located in the middle of the Red Desert. The approximately 1,432-acre site includes an ore pad, overburden pile, and the milling area (see Figure 5). The milling area consists of administrative buildings, the uranium mill building, a solvent extraction facility, and a maintenance shop. There is also a 60-acre tailings management area with a 37-acre tailings impoundment that contains approximately 2.5 million tons of tailings material. The Sweetwater impoundments are synthetically lined, as required in 40 CFR 192.32(a). The facility is in a standby status and has a possession only license administered by the NRC. The future plans associated with this facility are unknown, but the facility has been well maintained and is capable of processing uranium. The standby license for this facility is scheduled to expire in 2014. The licensee and/or regulator will decide whether to renew or to terminate this license.

Figure 5: Sweetwater – Aerial View

To demonstrate compliance with Subpart W, testing on the facility's tailings impoundment for radon emissions is conducted annually (KUC 2011). Table 5 shows the results of that testing. The lower flux readings measured in 2009 and 2010 are a direct result of the remediation work (regrading and lagoon construction in the tailings impoundment) performed in 2007 and 2008.

Table 5: Sweetwater Mill Radon Flux Testing Results

Test Date	Radon Flux (pCi/(m^2-sec))	Test Date	Radon Flux (pCi/(m^2-sec))
August 7, 1990	9.0	August 14, 2001	6.98
August 13, 1999	5.1	August 13, 2002	4.10
August 5, 1992	5.6	August 12, 2003	7.11
August 24, 1993	5.0	August 17, 2004	6.38
August 23, 1994	5.0	August 16, 2005	7.63
August 15, 1995	3.59	August 15, 2006	3.37
August 13, 1996	5.47	August 13, 2007	6.01
August 26, 1997	4.23	August 5, 2008	4.59
August 11, 1998	2.66	July 30, 2009	1.60
August 10, 1999	1.27	August 10, 2010	1.44
August 8, 2000	4.05		

Source: KUC 2011, p. 6

Summary of Results

Air monitoring data were reviewed for a 26-year period (1981 to 2007). Upwind Rn-222 measurements, as well as downwind Rn-222 values, were available. The average upwind radon value for the period of record was 3.14 picocuries per liter (pCi/L). The average downwind radon value for the same period was 2.60 pCi/L. These values indicate that there is no measurable contribution to the radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility.

Approximately 28.3 acres of tailings are dry with an earthen cover; the remainder of the tailings is continuously covered with water. The earthen cover is maintained as needed. One hundred radon flux measurements were taken on the exposed tailings, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed beaches was 8.5 pCi/(m^2-sec). The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/(m^2-sec). The calculated radon flux from the entire tailings impoundment surface is approximately 30% of the 20.0 pCi/(m^2-sec) standard.

3.2.2 White Mesa Mill, Energy Fuels Corporation, Blanding, Utah

The White Mesa project is a conventional uranium recovery facility located about 6 mi south of Blanding, Utah, in San Juan County. The approximately 5,415-acre site includes an ore pad, overburden pile, and the milling area (see Figure 6). The mill area occupies approximately 50 acres and consists of administrative buildings, the uranium milling building, and ancillary facilities. The facility used a phased disposal impoundment system, and two of the 40-acre cells are open. The facility has operated intermittently in the past, and this type of operation continues on a limited basis. The amount of milling that takes place, as well as the amount of uranium that is being produced, is a small fraction of the milling capacity. The uranium recovery project has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control.

Figure 6: White Mesa – Aerial View

To demonstrate compliance with Subpart W, the radon flux from tailings surfaces is measured and reported to the State of Utah annually. As Table 6 shows, these data consistently demonstrate that the radon flux from the White Mesa Mill's tailings cells are below the criteria.

Table 6: White Mesa Mill's Annual Radon Flux Testing, Tailings Cells 2 & 3

Year	Radon Flux (pCi/(m^2-sec))	
	Cell 2	**Cell 3**
1997	12.1	16.8
1998	14.3	14.9
1999	13.3	12.2
2000	9.3	10.1
2001	19.4	10.7
2002	19.3	16.3
2003	14.9	13.6
2004	13.9	10.8
2005	7.1	6.2

Source: Denison 2007, p. 116

The Table 6 radon flux values for 2001 and 2002 were elevated when compared to the prior years. Denison believes that these radon fluxes were largely due to the drought conditions in those years, which reduced the moisture content in the interim cover placed over the inactive portions of tailings Cells 2 and 3. In addition, the beginning of the 2002 mill run, which resulted in increased activities on the tailings cells, may have contributed to these higher values. As a result of the higher radon fluxes during 2001 and 2002, additional interim cover was placed on

the inactive portions of Cells 2 and 3. While this effort was successful, additional cover was applied again in 2005 to further reduce the radon flux (Denison 2007).

Summary of Results

Air monitoring data were reviewed for a 2-year period (2006 to 2008). The White Mesa site utilized the MILDOS code to calculate radon concentrations (ANL 1998), in the same calculation process that had been used since 1995. As a comparison, Denison Mines reactivated the six air monitoring stations that were used at the site. Data from these stations were collected for a 2-year period. The upwind and downwind measurements showed no definable trends. At times, the upwind concentrations were the higher values, while at other times, the downwind concentrations were the greatest. However, all values were within regulatory standards.

The tailings facilities at the White Mesa facility consist of the following impoundments/cells (Denison 2011):

- Cell 1, constructed with a 30-millimeter (mil) PVC earthen-covered liner, is used for the evaporation of process solution (Cell 1 was previously referred to as Cell 1-I, but is now referred to as Cell 1).

- Cell 2, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands. Cell 2 has 67 acres of surface area. Because 99% of the cell has a soil cover over the deposited tailings, only 0.7 acres of tailings are exposed as tailings beaches.

- Cell 3, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands and solutions. Cell 3 has 71 acres of surface area, and 54% of the cell has a soil cover over the deposited tailings. The remainder of the cell consists of tailings beaches (19%) and standing liquid (26%).

- Cell 4A, constructed with a geosynthetic clay liner, a 60-mil high-density polyethylene (HDPE) liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in October 2008.

- Cell 4B, constructed with a geosynthetic clay liner, a 60-mil HDPE liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in February 2011.

One hundred radon flux measurements were collected on the Cell 2 beach area, and an additional 100 measurements were taken on the soil-covered area in accordance with Method 115 for Subpart W analysis. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The average radon flux for all of Cell 2 was calculated to be 13.5 pCi/(m^2-sec), or about 68% of the 20.0 pCi/(m^2-sec) standard.

At Cell 3, 100 radon flux measurements were collected from each of the soil cover and the beach areas, as required by Method 115. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The radon flux from the standing liquid-covered area was assumed to be zero. The average radon flux for all of Cell 3 was calculated to be 8.9 pCi/(m^2-sec), or about 46% of the 20.0 pCi/(m^2-sec) standard.

3.2.3 Shootaring Canyon Mill, Uranium One Incorporated, Garfield County, Utah

The Shootaring Canyon project is a conventional uranium recovery facility located about 3 mi north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings management system that is partially constructed (see Figure 7). The mill circuit operated for a very short time and generated only enough tailings to cover 7 acres of the impoundment. Although the milling circuit has been dismantled and sold, the facility is in a standby status and has a possession only license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company. The standby license for this facility is scheduled to expire in 2014. The licensee and/or the regulator will decide whether to renew or to terminate this license.

Figure 7: Shootaring Canyon – Aerial View

Summary of Results

Air monitoring data were reviewed for a 2-year period (2009 to 2010). Continuous air monitoring is not conducted at the site; rather, a 20- to 24-hour sampling event is required once per quarter as a condition of the license. The high-volume air sampler is located downwind of the tailings facility. Many sampling events during a 2-year period indicate that the downwind

Rn-222 concentrations are around 1% of the allowable effluent concentration limit. The two years of data reviewed indicated no trends.

The Shootaring Canyon facility operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in an area of 2,508 m^2 (0.62 acres). The tailings are dry except for moisture-associated occasional precipitation events; consequently, there are no beaches. The tailings have a soil cover that is maintained by the operating company. The impoundment at Shootaring Canyon is synthetically lined, as required in 40 CFR 192.32(a).

One hundred radon flux measurements were collected on the soil-covered tailings area in accordance with Method 115. The 2009 sampling results indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), which exceeded the allowable 20 pCi/(m^2-sec) regulatory limit. In response to this result, the licensee notified the Utah Division of Radiation Control and placed additional soil cover on the tailings. The soil cover consisted of local borrow materials in the amount of 650 cubic yards. More sampling took place during the week of November 7, 2009. An additional 100 sample results were collected and showed that the average radon flux was reduced to 18.1 pCi/(m^2-sec). Sampling for 2010 took place in April. Again, 100 radon flux measurements were collected. The average radon flux revealed by this sampling was 11.9 pCi/(m^2-sec).

3.2.4 Piñon Ridge Mill, Bedrock, Colorado

The Piñon Ridge project is a permitted conventional uranium recovery facility in development. The permitted location is located about 7 mi east of Bedrock, Colorado, and 12 mi west of Naturita, Colorado, in Montrose County (see Figure 8). The approximately 1,000-acre site will include an administration building, a 17-acre mill site, a tailings management area with impoundments totaling approximately 90 acres, a 40-acre evaporation pond with proposed expansion of an additional 40-acre evaporation pond as needed, a 6-acre ore storage area, and numerous access roads. The design of the tailings management area is such that it can meet the work practice standard with a synthetically lined impoundment, a leak detection system, and a surface area that does not exceed 40 acres. The facility has not been constructed, but is fully licensed and administered by the Colorado Department of Public Health and Environment. Also, EPA has approved the facility’s license to construct under NESHAP Subpart A of 40 CFR 61. Current activities at the site are maintenance of pre-operational environmental monitoring.

Figure 8: Piñon Ridge – Aerial View

3.2.5 Conventional Mill Tailings Impoundments and Radon Flux Values

In summary, the radon data for the active mill tailings impoundments indicate that the radon exhalation rates from the measured surfaces have exceeded the regulatory standard of 20 pCi/(m^2-sec) at times. Two instances exist in the records that were reviewed. One instance was in 2007, when a portion of the Cotter Corporation impoundment did not have sufficient soil cover. Monitoring results showed a flux rate of 23.4 pCi/(m^2-sec). The tailings surface was covered with a soil mixture, and the flux rate was reduced to 14.0 pCi/(m^2-sec). The second instance in which the regulatory standard was exceeded was recorded during the 2009 sampling event at Shootaring Canyon Mill. This sampling event indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), caused by insufficient soil cover. Although covering tailings piles with various other materials (e.g., synthetics, asphalt, soil-cement mixtures) has been studied, covers made of earth or soil have been shown to be the most cost effective in reducing radon emissions (EPA 1989, NRC 2010). In both cases when monitoring indicated radon fluxes in excess of the standard, additional soil cover was added to the tailings, and the radon flux rates were reduced to below the regulatory standards.

Table 8 shows the average/calculated radon flux values, as reported by the uranium recovery operators.

Table 7: Mill Tailings Impoundments and Average/Calculated Radon Flux Values*

Facility	Radon Flux (pCi/(m^2-sec))		Calculated Tailings Impoundment Average Radon Flux (pCi/(m^2-sec))
	Soil-Covered Area	Tailings Beach	
Sweetwater Mill	No soil-covered area	8.5	6.01
White Mesa Mill, Cell 2	13.1	50.2	13.5
White Mesa Mill, Cell 3	13.9	6.7	8.9
Shootaring Canyon Mill	15 2-year average	Not applicable	15 2-year average
Piñon Ridge Mill	Not applicable	Not applicable	Not applicable

* The respective uranium recovery operators supplied all data and calculations.

3.3 In-Situ Leach Uranium Recovery (Solution Mining)

Solution, ISL or in-situ recovery (ISR), mining is defined as the leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface (IAEA 2005). Leaching, or more correctly the remobilization of uranium into solution, is accomplished through the injection into the ore body of a lixiviant. The injection of a lixiviant essentially reverses the geochemical reactions associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects of the 1980s demonstrated solution mining as a viable uranium recovery technique. Initial efforts at the solution mining process were often less than ideal:

- Lixiviant injection was difficult to control, primarily because of poor well installation.
- Laboratory-scale calculations did not always perform as suspected in geological formations.
- Recovery well spacing was poorly understood, causing mobilized solutions to migrate in unsuspected pathways.
- Restoration efforts were not always effective in re-establishing reducing conditions; therefore, some metals remained in solution and pre-mining ground water conditions were not always achievable.

Additional research and development work indicated that mining solutions could be controlled with careful well installation. The use of reducing agents during restoration greatly decreased the amount of metals that were in solution. As a result of these modifications in mining methods, solution mining of uranium became a viable method to recover some uranium deposits, many of which could not be economically mined by the open pit methods typically employed by the uranium industry. Additionally, the economics of solution mining were more favorable than conventional mining and milling. Because of these factors, solution mining and associated processing began to dominate the uranium recovery industry. Figure 10 shows a schematic of a typical ISL uranium recovery facility.

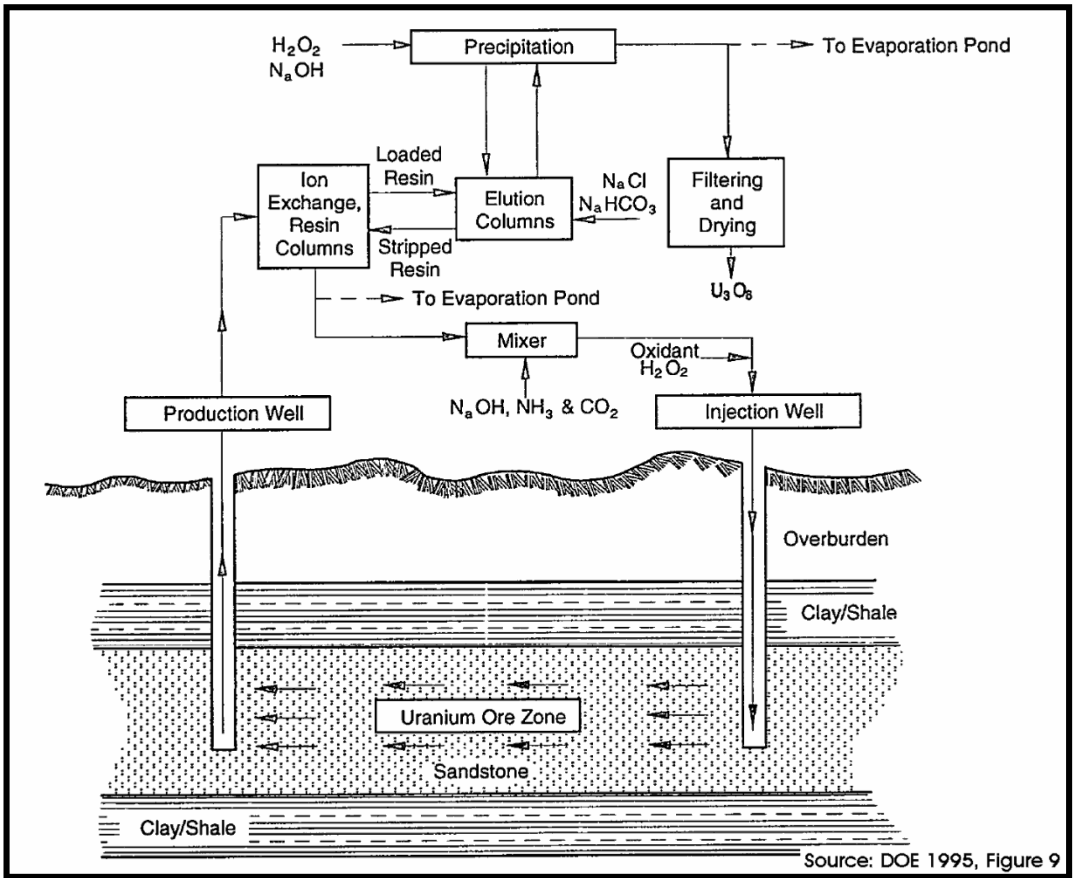


Figure 9: In-Situ Leach Uranium Recovery Flow Diagram

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. As Figure 10 shows, the liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. The pond/impoundment may be used to dispose of the liquid via evaporation, or it may be used simply to hold the liquid until a sufficient amount has been accumulated so that other means may be used to dispose of it (e.g., land application or irrigation, deep well disposal). Since Ra-226 is present in the water bled from the lixiviant, radon will be generated in and released from the solution mining facility’s evaporation/holding ponds or impoundments.

The 1989 NESHAP risk assessment (EPA 1989), although not conducted specifically for solution mining sites, is applicable to ponds/impoundments at solution mining facilities. All of the ponds at solution mining facilities are synthetically lined. Because of the presence of liners, none would be required to be closed. The solution mining industry is more transient in that the impoundment life is less than those at conventional uranium mining and milling sites. Typically, the impoundments are in the range of 1–4 acres and are built to state-of-the-art standards.

Two types of lixiviant solutions, loosely defined as acid or alkaline systems, can be used. In the United States, the geology and geochemistry of most uranium ore bodies favor the use of “alkaline” lixiviants or bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of

the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground water restoration. The acid systems once used in the United States are still used in Eastern Europe and Asia and were used recently in Australia on ore bodies in saline aquifers (IAEA 2005).

The four major types of uranium deposits in the United States are: strata-bound (roll front), solution breccia pipe, vein, and phosphatic deposits (EPA 1995). Of these, ISL is the uranium recovery technique used mostly on strata-bound ore deposits. Strata-bound ore deposits are ore deposits contained within a single layer of sedimentary rock. They account for more than 90% of the recoverable uranium and vanadium in the United States and are found in three major geographic areas: the Wyoming Basin (Wyoming and Nebraska), Colorado Plateau or Four Corners area (northwestern New Mexico, western Colorado, eastern Utah, and northeastern Arizona), and southern Texas. A discussion of the origin of the uranium ore, including ore body formation and geochemistry, may be found in the reference, *Technical Resource Document Extraction and Beneficiation of Ores and Minerals*, Volume 5, "Uranium" (EPA 1995). Much of the recoverable uranium in these regions lends itself to ISL because of the physical and geochemical properties of the ore bodies.

Four times a year, the Energy Information Administration (EIA) publishes data on the status of U.S. ISL facilities. EIA (2013) identified six ISL facilities that were recovering uranium and producing yellowcake in the 2nd quarter of 2013. Table 8 shows these facilities. These operations are located in NRC-regulated areas, as well as in Agreement States.

Table 8: Operating ISL Facilities

Plant Owner	Plant Name	County, State
Cameco	Crow Butte Operation	Dawes, Nebraska
Power Resources, Inc. dba Cameco Resources	Smith Ranch-Highland Operation	Converse, Wyoming
Uranium Energy Corp. dba South Texas Mining Venture	Hobson ISR Plant	Karnes, Texas
	La Palangana	Duval, Texas
Mestena Uranium LLC	Alta Mesa Project	Brooks, Texas
Uranium One USA, Inc.	Willow Creek Project (Christensen Ranch and Irigaray)	Campbell and Johnson, Wyoming

The two major geographical areas of ISL mining and processing have been Texas and Wyoming. These areas are well suited to this ISL mining technology, in that the geology associated with the mineralized zone is contained by layers of impervious strata. Texas is the major producer of uranium from ISL operations, followed by Wyoming. ISL operations in South Dakota and Nebraska recover lesser amounts of uranium.

For the 2nd quarter of 2013, EIA (2013) identified the ISL facilities shown in Table 9 as being developed, or partially or fully permitted and licensed, or under construction. As discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining actions.

As the data in Table 9 show, there is considerable interest in ISL mining operations in the U.S. uranium belt. Many of the existing ISL operations are planning for expansion by preparing the license applications and other permitting documents. It is apparent that most domestic uranium recovery will be associated with existing and new ISL operations.

Table 9: ISL Facilities That Are Restarting, Expanding, or Planning for New Operations

Plant Owner	Plant Name	County, State (existing and *planned* locations)	Status, 2nd Quarter 2013
Powertech Uranium Corp	Dewey Burdock Project	*Fall River and Custer, South Dakota*	Developing
Uranium One Americas, Inc.	Jab and Antelope	*Sweetwater, Wyoming*	Developing
Hydro Resources, Inc.	Church Rock	*McKinley, New Mexico*	Partially Permitted And Licensed
Hydro Resources, Inc.	Crownpoint	*McKinley, New Mexico*	Partially Permitted And Licensed
Strata Energy Inc	Ross	*Crook, Wyoming*	Partially Permitted And Licensed
Uranium Energy Corp.	Goliad ISR Uranium Project	*Goliad, Texas*	Permitted And Licensed
Uranium One Americas, Inc.	Moore Ranch	*Campbell, Wyoming*	Permitted And Licensed
Lost Creek ISR, LLC	Lost Creek Project	Sweetwater, Wyoming	Under Construction
Uranerz Energy Corporation	Nichols Ranch ISR Project	Johnson and Campbell, Wyoming	Under Construction

Table 10 shows the size of the surface impoundments at ISL facilities. It is noteworthy that the operation of these facilities does not require impoundments nearly as large as the impoundments used at conventional mills. The impoundments are utilized for the evaporative management of waste water. The impoundments are small because a minimal percentage of the process water needs to be over-recovered to maintain solution flow to the recovery wells. The solution mining industry has used deep well injection for most of the waste water. All signs indicate that this type of waste water disposal will continue in the future.

Table 10 shows that all of the solution mining sites reviewed are using the deep well injection method.

Table 10: ISL Evaporation Pond Data Compilation

Operation	Evaporation pond?	Date pond was constructed	Size of pond	Synthetic liner under pond?	Leak detection system?	Deep well injection?
Cameco, Smith Ranch	East and west ponds	1986	8.6 acres	Yes	Yes, ponds have had leaks	Yes, used for most waste water, started in 1999
Cameco, Crow Butte	3 commercial ponds and 2 R&D ponds	R&D ponds 1990	Pond 1, 2, 5 850×200 ft Pond 3, 4 700×250 ft	Yes	Yes	Yes, all bleed stream
Hydro Resources, Crown Point	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Hydro Resources, Church Rock	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Uranium Resources Inc., Kingsville Dome	Two 120×120 ft ponds	1990	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Vasquez	Two 150×150 ft ponds	1990	150×150 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Rosita	Two 120×120 ft ponds	1985	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Mestena, Alta Mesa	Evaporation data not found					
STMV, La Palangana	Evaporation data not found					

3.3.1 Radon Emission from Evaporation and/or Holding Ponds

Unlike conventional mills, ISL facilities do not produce tailings or other solid waste products. However, they do generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, an extraction solution (lixiviant), composed of ground water enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes the uranium. The resulting "pregnant" lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field. This is accomplished by bleeding off a portion of the process flow. Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant washdown. One method to dispose of these liquid wastes is to evaporate them from ponds. Deep well injection and land application (i.e., irrigation) are other methods for disposing of the liquid wastes. For these disposal methods, the waste liquid is collected in holding ponds until a quantity sufficient for disposal has been accumulated.

As defined by the AEA of 1954, as amended, byproduct material includes tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content (42 USC 2014(e)(2)). Clearly, waste water generated during solution mining is within this definition of byproduct material and is thus subject to the requirements of Subpart W.

The waste water contains significant amounts of radium, which will radiologically decay and generate radon gas. Radon diffuses much more slowly in water than it does in air. For example, the radon diffusion coefficient in water is about 10,000 times smaller than the coefficient in air (i.e., on the order of 10^{-5} square centimeters per second (cm^2/sec) for water and 10^{-1} cm^2/sec for air (Drago 1998, as reported in Brown 2010)). Thus, if the tailings piles are covered with water, then most of the radon would decay before it could diffuse its way through the water. However, since over time periods comparable to the half-life of radon, there is considerable water movement within a pond, advective as well as diffusive transport of radon from the pond water to the atmosphere must be considered. The water movement is partly caused by surface wind currents, thermal gradients, mechanical disturbance from the mill discharge pipe, and biological disturbances (animals, birds, etc.). Dye movement tests indicate that for shallow (less than 1 meter) pond water, advective velocities may exceed 1–2 millimeters per minute, resulting in virtually no radon containment by the surface water. If shallow water movement is sufficient to remove radon from the tailings-water interface and transport it to the atmosphere in a short time (several hours), the radon flux from the shallow tailings is nearly as great as that from similar bare saturated tailings; hence, no significant radon attenuation is gained by covering the tailings with water (Nielson and Rogers 1986). Consequently, in order for a pond covering a tailings pile to be effective at reducing the release of radon, the pond water must be greater than 1 meter in depth.

Additionally, if there is radium in the pond water, radon produced from that radium could escape into the atmosphere. A review of the various models used for estimating radon flux from the

surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model (Schwarzenbach et al. 2003)), coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond's water and the assumption that radon is in secular equilibrium with the radium. The radon flux from the surface of an evaporation pond, as a function of the wind speed (for winds less than 24 miles per hour (mph)), can be estimated using this model with the following equation:

$$J = \frac{1.48 \times 10^{-4}}{e^{-0.351V}} C_w \qquad (3\text{-}1)$$

Where	J	=	Radon flux	(pCi/(m^2-sec))
	C_w	=	Concentration of radium in the water	(pCi/L)
	V	=	Wind speed	(m/sec)

Implicit in this model is the fact that in pond water the radon diffusion coefficient is 10^{-5} cm^2/sec and that the thickness of the stagnant film layer can be estimated by an exponential relationship with wind speed (Schwarzenbach et al. 2003).

Baker and Cox (2010) measured the radium concentration in an evaporation pond at the Homestake Uranium Mill Site at 165 pCi/L. Assuming a direct conversion to Rn-222 (165 pCi/L), the flux is estimated from equation 3-1 at 1.65 pCi/(m^2-sec). This is comparable to measurements of the flux, which averaged 1.13 pCi/(m^2-sec). However, the Homestake measurement method did not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data were found for measurements of the radon flux on evaporation ponds versus wind speed.

The model should not be used for wind speeds above 10 meters per second (m/sec) (24 mph). However, this is not expected to be a major limitation for estimating normal radon releases and impacts from operational evaporation ponds.

Using actual radium pond concentrations and wind speed data in equation 3-1, the radon pond flux was calculated from several existing ISL sites (SC&A 2010). Results showed that the radon flux ranged from 0.07 to 13.8 pCi/(m^2-sec). This indicates that the radon flux above some evaporation ponds can be significant (e.g., can exceed 20 pCi/(m^2-sec)). If such levels occur, there are methods for reducing the radium concentration in the ponds, the most straightforward being dilution. However, this solution is temporary, as evaporation will eventually increase the concentration. A second method is to use barium chloride ($BaCl_2$) to co-precipitate the radium to the bottom of the pond. The radon generated at the depths of the bottom sediments will decay before reaching the pond surface.

Again using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from three sites. The evaporation pond contribution to the site's total radon release was small (i.e., less than 1%).

Two additional sources of radon release were investigated: the discharge pipe and evaporation sprays. The discharge pipe is used to discharge bleed lixiviant to the evaporation pond. Radon

releases occur when the bleed lixiviant exits the pipe and enters the pond. The investigation found that these radon releases are normally calculated using the methodology in NUREG-1569, Appendix D (NRC 2003); thus, this source is currently included in the total radon releases reported for an ISL site. For a "typical" ISL, with a purge water radon concentration of 3.2×10^5 pCi/L and a purge rate of 5.5×10^5 liters per day (L/d) or about 100 gallons per minute (gpm), NUREG-1569, Appendix D, calculated the radon released from the discharge pipe to be 64 Ci/yr.

Spray systems are sometimes used to enhance evaporation from the ponds. A model to calculate radon releases during spray operation was developed (SC&A 2010). Also, data from ISL ponds were used to estimate this source of radon release. The radon releases from spray operations were reported to range from <0.01 to <3 pCi/(m^2-sec) (SC&A 2010). Furthermore, operation of the sprays would reduce the radon concentration within the pond; therefore, the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium). Hence, operation of spray systems to enhance evaporation is not expected to significantly increase the amount of radon released from the pond.

3.4 Heap Leaching

Heap leaching is a process by which chemicals are used to extract the uranium from the ore. A large area of land is leveled with a small gradient, layering it with HDPE or linear low-density polyethylene (LLDPE), sometimes with clay, silt or sand beneath the plastic liner. Ore is extracted from a nearby surface or an underground mine. The extracted ore will typically be run through a crusher and placed in heaps atop the plastic. A leaching agent (often H_2SO_4) will then be sprayed on the ore for 30–90 days. As the leaching agent percolates through the heap the uranium will break its bonds with the oxide rock and enter the solution. The solution will then flow along the gradient into collecting pools from which it will be pumped to an onsite processing plant.

In the past, there have been a few commercial heap leach facilities, but currently none are operating. However, this type of facility can be rapidly constructed and put into operation. Planning and engineering have begun for two heap leach facilities. At the spring 2010 joint NMA/NRC Uranium Recovery Workshop, the NRC identified two proposed heap leach projects, one in Wyoming and the other in New Mexico, as shown in Table 11. In addition to these two projects, Cotter has indicated to the Colorado Department of Public Health and Environment that it intends to retain the use of the secondary impoundment at its Cañon City site for heap leaching in the future (Hamrick 2011).

Table 11: Anticipated New Heap Leach Facilities

Owner	Site	State
Energy Fuels[4]	Sheep Mountain	Wyoming
Uranium Energy Corporation	Grants Ridge	New Mexico

Source: NMA 2010

[4] Energy Fuels acquired the Sheep Mountain Project through its acquisition of Titan Uranium Inc. in February 2012 (http://www.energyfuels.com/development_projects/sheep_mountain/, accessed 9/25/2013).

Higher uranium prices will likely lead to the processing of low-grade ore currently found in the uranium districts in Wyoming and New Mexico. Much of the low-grade ore currently exists in spoil piles that were not economical to truck to milling operations. Little processing equipment is necessary to bring heap leach operations on line. Additionally, minimal personnel are necessary to operate and monitor such an operation. However, the application of NESHAP Subpart W to heap leach facilities should be clarified (see Section 5.0). At a minimum, it is expected that these types of facilities will be limited in acreage according to the Subpart W standard and will be required to have synthetic liners with monitored leak detection systems.

Attempts have been made at heap-leaching low-grade uranium ore, generally by the following process:

(1) Small pieces of uncrushed ore are placed in a pile, or "heap", on an impervious pad of plastic, clay, or asphalt, to prevent uranium and other chemicals from migrating into the subsurface.

(2) An acidic solution is then sprayed onto the heap, which dissolves the uranium as it migrates through the ore.

(3) Perforated pipes under the heap collect the uranium-rich solution, and drain it to collection basins, from where it is piped to the processing plant.

(4) At the processing plant, uranium is concentrated, extracted, stripped, and dried to produce a material called "yellowcake."

(5) Finally, the yellowcake is packed in 55-gallon drums to be transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 10 shows a schematic of a typical heap-leaching uranium recovery facility.

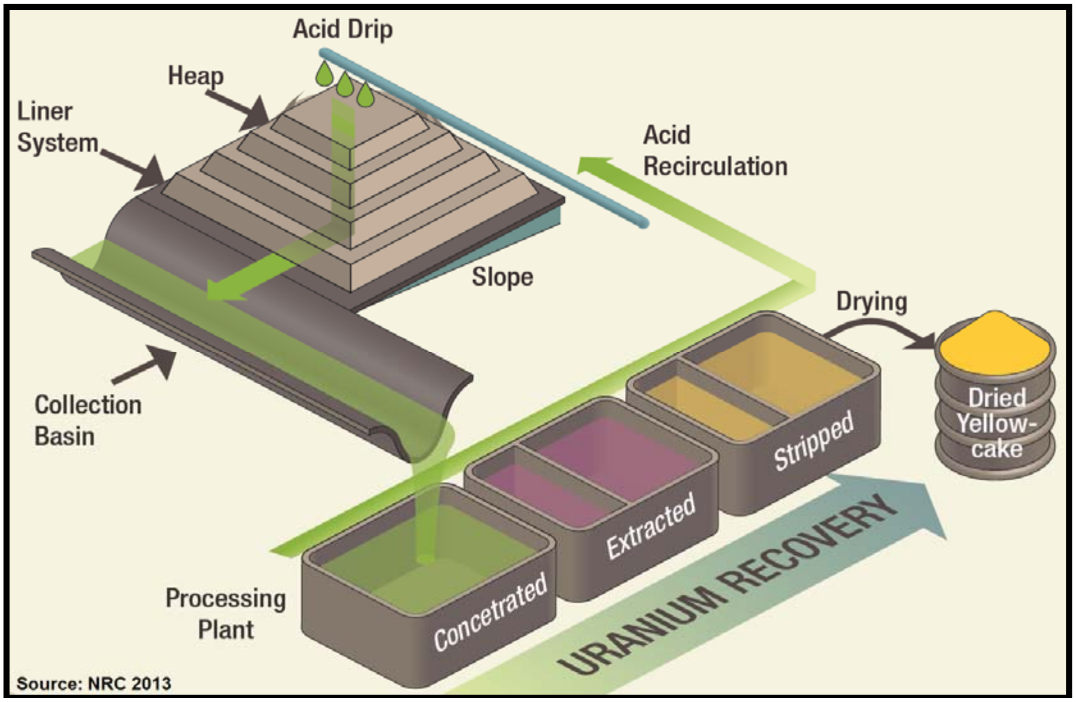


Figure 10: Typical Heap-Leaching Uranium Recovery Facility

Heap-leaching was not an industry trend; rather, it was an attempt to process overburden that contained a minimal concentration of uranium. Production records associated with this processing technique were not maintained, but certainly the technique represented less than 1% of the recovered uranium resources. Almost all of the conventional uranium recovery operations were stand-alone facilities that included the mining, milling, processing, drying, and containerization of the yellowcake product. The yellowcake product was then trucked to processing facilities that refined the raw materials into the desired product.

3.4.1 Sheep Mountain Mine, Energy Fuels, Fremont County, Wyoming

The Sheep Mountain mine, located at approximate 42º 24' North and 107º 49' West, has operated as a conventional underground mine on three separate occasions. Mining on the Sheep Mountain property started in 1956 and continued in several open pit and underground operations until 1982. The Sheep I shaft was sunk in 1974, followed by the Sheep II shaft in 1976. Production from the Sheep I shaft in 1982 was reported to be 312,701 tons at an average grade of 0.107% U_3O_8 (triuranium octoxide). In 1987, an additional 12,959 tons at 0.154% U_3O_8 were produced, followed by 23,000 tons at 0.216% U_3O_8 in 1988. The Sheep II shaft has had no production. The Congo Pit is essentially a single open pit which was being readied for development in the early 1980s, but plans were never realized because of the collapse of the uranium market. Feed from Sheep Mountain was processed at the Split Rock Mill, which was located north of Jeffrey City. Figure 11 shows the Sheep Mountain mine.

Figure 11: Sheep Mountain – Aerial View

Energy Fuels plans to develop the Sheep Mountain mine with both conventional underground and open pit mining, followed by heap leach extraction of the uranium with an ion-exchange recovery plant producing up to 1.5 million pounds of U_3O_8 per year. Energy Fuels' plans include the development of both the Sheep I and Sheep II underground mines, with access from twin declines. At its peak production, the underground mine will produce approximately 1.0 million pounds U_3O_8 per year. The Congo Pit will also be developed, producing an average of 500,000 pounds U_3O_8 per year. Recovery of the uranium will include heap leach pads using H_2SO_4 and a conventional recovery plant, through to yellowcake production on site. Assuming no re-use of heap pads, there will be 100 heap leaching cells, each with a capacity of 66,000 tons of material stacked to a height of 25 feet (ft) over an area of 40 ft by 100 ft. The mineral processing rate will be 500,000 tons per year or greater (Titan Uranium 2010).

Currently, the Wyoming Department of Environmental Quality has issued a fully bonded mining permit to Titan (now Energy Fuels). Energy Fuels is in the process of developing a source material license application for submittal to the NRC around mid-2011. The review and approval process is expected to take about 2 years (i.e., the NRC will complete it in mid-2013). Finally, the Plan of Operation (POO) is being developed and expected to be submitted to the U.S. Bureau of Land Management also around mid-2011. Submittal of the POO will trigger development of an environmental impact statement (EIS). This POO/EIS process is expected to be completed by the end of 2012 (Titan Uranium 2011).

3.5 Method 115 to Monitor Radon Emissions from Uranium Tailings

Subpart W (40 CFR 61.253) requires that compliance with the existing emission standards for uranium tailings be achieved through the use of Method 115, as prescribed in Appendix B to 40 CFR 61. Method 115 consists of numerous sections that discuss the monitoring methods that

must be used in determining the Rn-222 emissions from underground uranium mines, uranium mill tailings piles, phosphogypsum stacks, and other piles of waste material that emits radon.

For uranium tailings piles, Method 115, Section 2.1.3, specifies the minimum number of flux measurements considered necessary to determine a representative mean radon flux value for each type of region on an operating pile:

- Water covered area—no measurements required as radon flux is assumed to be zero.
- Water saturated beaches—100 radon flux measurements.
- Loose and dry top surface—100 radon flux measurements.
- Sides—100 radon flux measurements, except where earthen material is used in dam construction.

The requirement of 300 measurements may result in more measurements then are necessary under the Subpart W design standards. For example, under design standard 40 CFR 61.252(b)(2) for continuous disposal, only 10 acres are uncovered at one time. The 300 flux measurements on a 10-acre area translate into one measurement every 1,500 ft^2, or one every 40 ft. At the time Method 115 was developed and amended to Appendix B (i.e., 1989), the uranium tailings areas were much larger than the Subpart W design standards presently allow. For example, DOE/EIA-0592 (1995) indicates that some mills had tailings areas of over 300 acres (although not necessarily in a single pile).

Method 115, Section 2.1.6, indicates that measuring "radon flux involves the adsorption of radon on activated charcoal in a large-area collector." Since 1989, there have been advances in methods of measuring radon flux. George (2007) is particularly relevant in terms of radon measuring devices:

> *In the last 20 years, new instruments and methods were developed to measure radon by using grab, integrating, and continuous modes of sampling. The most common are scintillation cell monitors, activated carbon collectors, electrets, ion chambers, alpha track detectors, pulse and current ionization chambers, and solid state alpha detectors.*

In George (2007) radon detection is divided into:

I. Passive integrating radon measurements

   (1) Activated carbon collectors of the open face or diffusion barrier type. Charcoal canisters often employ a gamma spectrometer to count the radon daughters as surrogates (bismuth-214, for example). Liquid scintillation vials also use alpha and beta counting. About 70% of radon measurements in the United States are canister type.

(2) Electret ion chambers are being used for 2–7 days duration to measure the voltage reduction (drop). The voltage drop on the electrets is proportional to the radon concentration. About 10%–15% of radon measurements use this methodology.

(3) Alpha track detectors are used for long-term measurements. Alphas from radon penetrate a plastic lattice, which is etched with acid, and the resulting tracks are counted. There is some use in the United States, but this is more popular in Europe.

II. Passive or active continuous radon measurements

(1) Scintillation cell monitors mostly include the flow-through type.

(2) Current and pulse ionization chambers (mostly passive).

(3) Solid state devices are either passive or active if they use a pump to move air through the sensitive volume of the monitor like the RAD 7, which uses a solid state alpha detector (passive implanted planar silicon (PIPS) detector).

Additionally, the Oak Ridge Institute for Science and Education (ORISE) compared various radon flux measurement techniques (ORISE 2011), including activated charcoal containers, the Electric Passive Environmental Radon Monitor (E-PERM) electret ion chamber, the AlphaGUARD specialized ionization chamber, semiconductor detectors to measure radon daughters, and ZnS(Ag) (silver doped zinc sulfide) scintillation detectors. ORISE stated that the last two techniques were not yet commercially available and that the AlphaGUARD detector was "expensive," and thus they are not currently candidates for radon flux monitoring of uranium tailings. Comparing the activated charcoal containers to the E-PERM, ORISE found that while both were easy to operate and relatively inexpensive, the E-PERM showed smaller variations in measurements, and the activated charcoal containers had higher post-processing costs. The only disadvantage of the E-PERM was that its Teflon disks must be replaced after each use. Based on this comparison, ORISE recommended that for a large number of measurements, such as those needed to comply with Subpart W, E-PERM flux monitors would be best.

This brief review of Method 115 demonstrates that its use can still be considered current for monitoring radon flux from uranium tailings. However, it is important to note that the specific design protocols were developed for use at larger tailings impoundments. Alternatively, many commercial enhancements to that design are widely available and in use today. Other forms of passive detectors, as well as active measurement detectors, are also acceptable alternatives to demonstrate conformance with the standard. In addition, the method as currently written has some elements and requirements that should be reviewed and possibly revised, particularly the location and the frequency of measurement. These would be better based on statistical considerations or some other technical basis. Additional discussion of the continued applicability of Method 115 appears in SC&A 2008, ORISE 2011, and George 2007.

4.0 CURRENT UNDERSTANDING OF RADON RISK

Subpart W regulates the emission of radon from operating uranium recovery facility tailings. To enhance the understanding of the need for Subpart W, this section presents a qualitative review and analysis of changes in the analysis of the risks and risk models associated with radon releases from uranium recovery tailings since the publication of the 1989 BID (EPA 1989). After presenting some brief radon basics, the analysis focuses on three areas that have evolved: radon progeny equilibrium fractions, empirical risk factors, and the development of dosimetric risk factors. Finally, Section 4.4 presents the results of a risk assessment performed using current methodology (i.e., CAP88, Version 3 (TEA 2007)), 2011 estimated population distributions, and historical radon release data. Section 4.4 also discusses and compares the current calculated risks to the 1989 risk assessment results, presented in Section 2.3.

4.1 Radon and Dose Definitions

Rn-222 is a noble gas produced by radioactive decay of Ra-226. As shown in Figure 12, one of the longer-lived daughters in the uranium (U)-238 decay series, Ra-226 is a waste product in uranium tailings and liquids from uranium recovery facilities. These include mills, evaporation and surge ponds, typically found in ISL facilities, and heap leach piles. Radium (and its daughter radon) is also part of the natural radiation environment and is ubiquitous in soils and ground water along with its parent uranium.

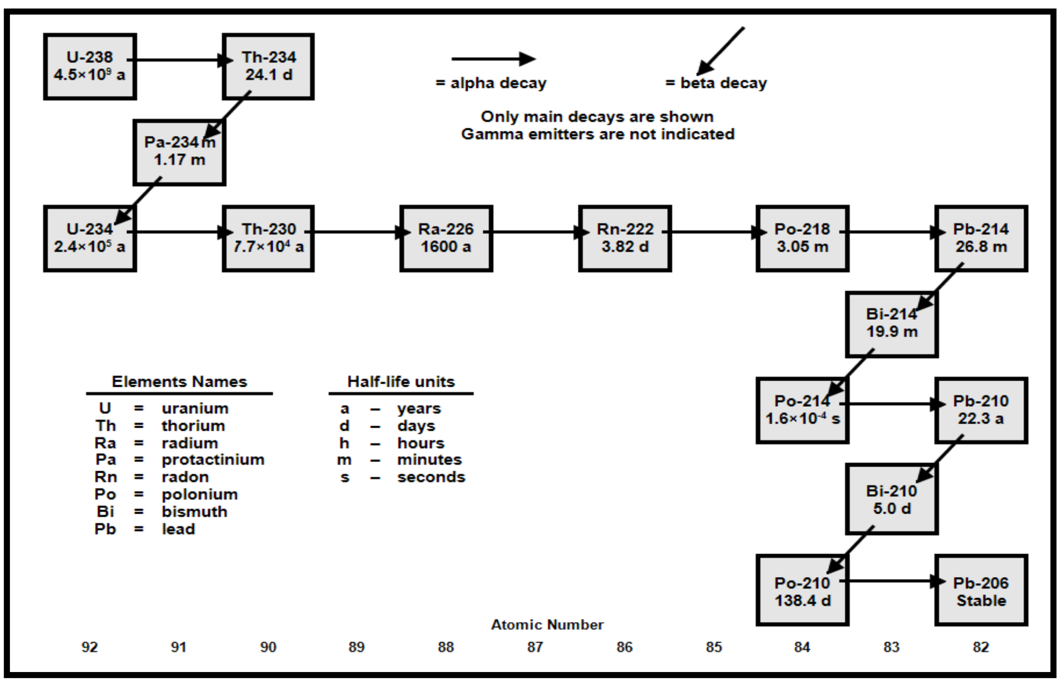


Figure 12: Uranium Decay Series

Radon, with a half-life of 3.8 days, decays into a series of short half-life daughter products or progeny. Being chemically inert, most inhaled radon is quickly exhaled. Radon progeny, however, are charged and electrostatically attach themselves to inhalable aerosol particulates, which are deposited in the lung or directly onto lung tissue. These progeny undergo decay,

releasing alpha, beta, and gamma radiation that interacts directly with lung tissue. Of these interactions, alpha particles from polonium-218 and polonium-214 are the most biologically damaging. The resulting irritation of lung cell tissue particularly from these alpha particles enhances the risk of developing a lung cancer. Determining an estimate of the risk of developing a cancer is of primary importance to establishing the basis for any regulatory initiatives.

4.2 Radon Risk Factors

In 1988, the National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) presented a report on the health risks of radon (BEIR IV, NAS 1988). BEIR IV derived quantitative risk estimates for lung cancer from analyses of epidemiologic data from underground miners. The risk factor presented in BEIR IV for radon was 350 cancer deaths per million person-WLMs[5] of exposure.

The International Commission on Radiological Protection (ICRP), in its Publication 50 (ICRP 1987), addressed the question of lung cancer risk from indoor radon daughter exposures. The ICRP Task Group took a direction quite different from that of the BEIR Committee. The Task Group reviewed published data on three miner cohorts: U.S., Ontario, and Czech uranium miners. When the ICRP 50 relative risk model was run with the 1980 U.S. life table and vital statistics, the combined male and female reference risk was calculated in the 1989 BID to be 4.2×10^{-4} cancer deaths per WLM.

In the 1989 BID, EPA averaged the male and female BEIR IV and ICRP 50 risk coefficients and adjusted the coefficients for background, so that the risk of an excess lung cancer death for a combined population (men and women) was 3.6×10^{-4} WLM^{-1}, with a range from 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1} (EPA 1989).

In addition to epidemiological radon risk coefficients, dosimetric models have been developed as a widely acceptable approach to determine the effects of exposures to radon progeny. One of the principal dosimetric models used to calculate doses to the lung following inhalation of radon and its daughters is the ICRP Human Respiratory Tract Model (HRTM), first introduced in ICRP Publication 66 (ICRP 1994). The ICRP used the HRTM to develop a compilation of effective dose coefficients for the inhalation of radionuclides, presented in Publication 72 (ICRP 1996).

Shortly after the publication of ICRP Publication 72, and using the information in that report, EPA developed Federal Guidance Report 13 (FGR 13) (EPA 1999)[6]. In addition to the risk factors given in FGR 13 itself, the FGR 13 CD Supplement (EPA 2002) provides dose factors, as well as risk factors, for various age groups. For this study, the dose and risk factors from the

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[5] Radon concentrations in air are commonly expressed in units of activity (e.g., picocuries (pCi) or becquerels) per unit volume (e.g., liters (L)); however, radon progeny concentrations are commonly expressed as working levels (WLs). In a closed volume, the concentration of short-lived radon progeny will increase until equilibrium is reached, under these conditions, each pCi/L of radon will give rise to (almost precisely) 0.01 WL, or 100 pCi/L = 1 WL (EPA 2003). Exposure to 1 WL for 1 month (i.e., 170 hours) is referred to as 1 working level month (WLM).

[6] Since FGR 13 was published, several organizations have produced updated radiation risk estimates. EPA 2011 reviewed the update risk estimates and concluded that the new mortality estimates do not differ greatly from those in FGR-13.

FGR 13 CD Supplement were used to calculate the dose and risk due to exposure to 1 WLM of radon and its progeny. The calculation assumed a radon airborne concentration of 100 pCi/L, a radon progeny equilibrium fraction of 0.4, a breathing rate of 0.9167 cubic meters per hour (m^3/hr), and an exposure duration of 170 hours.

The results of this calculation demonstrate that the FGR 13 based radon progeny lung dose conversion factor is between about 2.1 to 7.0 millisieverts (mSv)/WLM, depending on the age of the individual being exposed. The results also show that the lifetime fatality coefficient from lung exposure is between about 6×10^{-4} to 2.4×10^{-3} WLM^{-1}, depending on the exposed individual's age. This agrees well with the factor calculated from empirical data.

In conclusion, the radon progeny risk factor from FGR 13 of 6×10^{-4} WLM^{-1} used in this analysis falls within the risk factor range identified in the 1989 BID (i.e., 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1}), and is about 67% larger than the 3.6×10^{-4} WLM^{-1} radon progeny risk factor used in the 1989 BID. Thus, the radon progeny risk factor used in this Subpart W analysis updates the risk factor used in the 1989 BID to reflect the current understanding of the radon risk, as expressed by the ICRP and in FGR 13.

4.3 Computer Models

Various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium mines were compared. Seven computer programs were considered for use in the uranium tailings radon risk assessment: CAP88 Version 3.0, RESRAD-OFFSITE, MILDOS, GENII, MEPAS, AIRDOS, and AERMOD. A detailed selection process was used to select the program from the first five programs listed. AIRDOS was not included in the detailed selection process, since it is no longer an independent program, but has been incorporated into CAP88 Version 3.0. Because it calculates only atmospheric dispersion, but not radiological doses or risks, AERMOD was also not included. The five remaining programs received a score between 0 and 5 for each of the following 11 criteria: (1) Exposure Pathways Modeled, (2) Population Dose/Risk Capability, (3) Dose Factors Used, (4) Risk Factors Used, (5) Meteorological Data Processing, (6) Source Term Calculations, (7) Verification and Validation, (8) Ease of Use/User Friendly, (9) Documentation, (10) Sensitivity Analysis Capability, and (11) Probabilistic Analysis Capability. Also, each criterion had a weighting factor of between 1 and 2. The total weighted score was calculated for each code, and CAP88 was selected for use in this evaluation. A more complete discussion of the selection of the risk assessment computer code appears in SC&A 2010.

As described in Section 2.3, the 1989 BID used the computer codes AIRDOS-EPA, RADRISK, and DARTAB to calculate the risks due to radon releases from uranium tailings. Subsequent to the publication of the 1989 BID, CAP88 Version 3.0 was produced. CAP88 Version 3.0 was originally composed of the AIRDOS-EPA and DARTAB computer codes and the dose and risk factors from RADRISK (see Section 2.3). CAP88 Version 3.0 was first used for DOE facilities to calculate effective dose equivalents to members of the public to ensure compliance with the then-issued NESHAP Subpart H rules (TEA 2007). Currently, CAP88 Version 3.0 incorporates the dose and risk factors from FGR 13 for determining risks from radionuclides, including the radon decay daughters.

When calculating doses and risk from Rn-222, CAP88 Version 3.0 can be run in two different modes, either normally or in the “radon only” mode. When run in the normal mode, CAP88 Version 3.0 treats radon and its progeny as any other radionuclide and its progeny would be treated. That is, the radon is decayed as it travels from the release point to the dose receptor location, and the in-growth of the progeny is calculated. At the dose receptor location, doses are calculated assuming all the normal exposure pathways, including inhalation and air submersion, that are normally associated with radon doses, and also the exposure pathways from the longer lived radon progeny that deposit onto the ground, including ground shine and food ingestion. To perform these calculations, CAP88 Version 3.0 used the dose and risk factors from FGR 13.

In the “radon only” mode, CAP88 Version 3.0 calculates the risk from the radon WL concentration, but not the dose. The annual risk to an individual or population at a location is simply the WL concentration multiplied by a risk coefficient. The risk coefficient used by CAP88 Version 3.0 is 1.32 cancer fatalities per year per WL. Although this risk coefficient is not documented in any of the CAP88 Version 3.0 user manuals, so its origin is unknown, it can be derived from the CAP88 Version 3.0 output files. A risk coefficient of 1.32 WL-year^{-1} is equivalent to 2.56×10^{-2} cancer deaths per WLM, which is about two orders of magnitude larger than the risk coefficient discussed in Section 4.2. Thus, CAP88’s “radon only” mode was not used to calculate the risk estimates that are summarized in the next section. Rather, the risk estimates are based on CAP88’s atmospheric transport model (for radon decay and progeny buildup) and the radionuclide-specific risk factors from FGR 13.

4.4 Uranium Recovery Facility Radon Dose and Risk Estimates

To perform the CAP88 dose/risk analysis, three types of data were necessary: (1) the distribution of the population living within 80 km (50 mi) of each site, (2) the meteorological data at each site, particularly the wind speed, wind direction, and stability class, and (3) the amount of radon annually released from the site.

Dose/risk assessments were performed for the uranium recovery sites identified in Table 12, which include conventional uranium mills and ISL mines, plus two hypothetical generic sites developed to represent the western and eastern United States.

Table 12: Uranium Recovery Sites Analyzed

Mill / Mine	Type	State	Regulator	Latitude			Longitude		
				deg	min	sec	deg	min	sec
Crow Butte	In-Situ Leach	NE	NRC	42	38	41	-103	21	8
Western Generic	Conventional	NM	NRC	35	31	37	-107	52	52
Alta Mesa 1, 2, 3	In-Situ Leach	TX	State	26	53	59	-98	18	29
Kingsville Dome 1,3	In-Situ Leach	TX	State	27	24	54	-97	46	51
White Mesa Mill	Conventional	UT	State	37	34	26	-109	28	40
Eastern Generic	Conventional	VA	NRC	38	36	0	-78	1	11
Smith Ranch - Highland	In-Situ Leach	WY	NRC	43	3	12	-105	41	8
Christensen/Irigaray	In-Situ Leach	WY	NRC	43	48	15	-106	2	7
Sweetwater Mill	Conventional	WY	NRC	42	3	7	-107	54	41

Normally, the population doses and risks are calculated out to a distance of 80 km (50 mi) from the site. Therefore, it was necessary to know the population to a distance of 80 km from each site in each of the 16 compass directions. This information is not normally available from U.S. Census Bureau data. However, in 1973, EPA wrote a computer program, SECPOP (Sandia 2003), which would convert census block data into the desired 80-km population estimates for any specific latitude and longitude within the continental United States. The NRC adopted this program to perform siting reviews for license applications and has updated the program to use the 2000 census data. SC&A (2011) used the SECPOP program to estimate the population distribution around each site; that population was then modified to account for changes in the population from 2000 to 2010.

For those sites where site-specific meteorological data were identified, those site-specific data were used. For other sites, CAP88 Version 3.0 is provided with a weather library of meteorological data from over 350 National Weather Service stations. For sites without site-specific meteorological data, data from the National Weather Service station nearest the site were used.

Annual radon release estimates were determined for each site based on the available documentation for the site. For example, some sites reported their estimated radon release in their semiannual release reports, while other sites calculated their radon release as part of their license application or renewal application. Finally, for some sites, the annual radon release estimates were obtained from the NRC-produced, site-specific environmental assessment. If multiple documents provided radon release estimates for a particular site, the estimate from the most recent document was used. Consistent with the 1989 assessment, in order to bound the risks, radon releases were estimated from both process effluents and impoundments. Likewise, if both theoretical and actual radon release values were identified for a site, the actual radon release value was given preference.

Additional descriptions of each site’s population, meteorology, and radon source term may be found in SC&A 2011. Doses and risks to the RMEI and to the population living within 80 km of the facility were calculated. The RMEI is someone who lives near the facility and is assumed to have living habits that would tend to maximize his/her radiation exposure. For example, the RMEI was assumed to eat all of his/her vegetables from a garden located nearest the facility, which is contaminated with radon progeny as a result of radon releases from the facility. On the other hand, population doses and risks are based on the number of individuals who live within 80 km of the facility. These people are also assumed to eat locally grown vegetables, but not necessarily from the garden located nearest the facility. The RMEI’s dose and risk are included within the population dose and risk, since he/she lives within the 80-km radius.

Table 13 presents the RMEI and population doses and risks due to the maximum radon releases estimated for each uranium site.

Table 13: Calculated Maximum Total Annual RMEI, Population Dose and Risk

Uranium Site	Maximum Radon Release (Ci/yr)	Annual Dose		LCF[a, b] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	0.5	1.2	2.9E-06	6.0E-07
White Mesa	1,750	5.2	12.0	3.4E-05	6.4E-06
Smith Ranch - Highlands	36,500	3.7	1.5	2.3E-05	7.7E-07
Crow Butte	8,885	2.7	3.3	1.7E-05	1.7E-06
Christensen/Irigaray	1,600	3.8	1.9	2.4E-05	9.9E-07
Alta Mesa	740	21.6	11.5	1.3E-04	6.1E-06
Kingsville Dome	6,958	58.0	11.3	3.8E-04	6.1E-06
Eastern Generic	1,750	200.3	28.2	1.4E-03	1.6E-05
Western Generic	1,750	5.1	6.0	2.7E-04	7.7E-06

[a]Latent Cancer Fatalities
[b]In this table all risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39.

Table 14 presents the RMEI and population doses and risks due to the average radon releases estimated for each uranium site. The risks were based on average radon releases to make it easier to convert these annual risk values into lifetime risk values. This conversion is done by simply multiplying the Table 14 values by the number of years that the facility operates for the population risk, or by the length of time that the individual lives next to the facility for the RMEI risk.

Table 14: Calculated Average Total Annual RMEI, Population Dose and Risk

Uranium Site	Average Rado n Release (Ci/yr)	Annual Dose		LCF[a] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Populatio n	RMEI
Sweetwater	1,204	0.3	0.7	1.7E-06	3.5E-07
White Mesa	1,388	3.0	7.0	2.0E-05	3.7E-06
Smith Ranch - Highland s	21,100	2.2	0.9	1.3E-05	4.5E-07
Crow Butte	4,467	1.6	1.9	1.0E-05	1.0E-06
Christensen/Irigaray	1,040	2.2	1.1	1.4E-05	5.7E-07
Alta Mesa	472	12.5	6.7	7.6E-05	3.6E-06
Kingsville Dome	1,291	33.6	6.6	2.2E-04	3.5E-06
Eastern Generic	1,388	116.3	16.4	7.9E-04	9.2E-06
Western Generic	1,388	3.0	3.5	1.6E-04	4.4E-06

[a]Latent Cancer Fatalities

The dose and risk to an average member of the population within 0–80 km of each site may be calculated by dividing the population doses and risks from Table 13 and Table 14 by the population for each site. Table 15 shows the results of that calculation.

Table 15: Dose and Risk to an Average Member of the Population

Uranium Site	Dose (mrem)		LCF[a] Risk (yr^{-1})	
	Average Release	Maximum Release	Average Release	Maximum Release
Sweetwater	0.03	0.05	1.6E-07	2.7E-07
White Mesa	0.15	0.25	9.6E-07	1.6E-06
Smith Ranch - Highlands	0.03	0.05	1.7E-07	2.9E-07
Crow Butte	0.05	0.08	3.1E-07	5.3E-07
Christensen/Irigaray	0.06	0.11	3.8E-07	6.6E-07
Alta Mesa	0.03	0.05	1.6E-07	2.7E-07
Kingsville Dome	0.07	0.13	4.8E-07	8.3E-07
Eastern Generic	0.05	0.09	3.7E-07	6.4E-07
Western Generic	0.04	0.07	2.2E-06	3.8E-06

[a]Latent Cancer Fatalities

As Table 15 shows, the annual latent cancer fatality (LCF) risk to an average member of the population surrounding a uranium site ranges from 1.6×10^{-7} to 1.6×10^{-6} for the seven actual sites, and from 3.7×10^{-7} to 3.8×10^{-6} for the two hypothetical generic sites.

The study estimated that the annual fatal cancer risk to the RMEI ranges from 3.5×10^{-7} to 6.4×10^{-6} for the seven actual sites, and from 4.4×10^{-6} to 1.6×10^{-5} for the two hypothetical generic sites. The highest annual individual risk occurred at the Eastern Generic site, which is not surprising considering that the nearest individual was assumed to reside only about 1 mi from the hypothetical site. It is likely that during the site selection process for an actual facility, a site this close to residences would be eliminated and/or the design of the facility would include features for reducing radon emissions in order to reduce the RMEI risk.

The lifetime risk would depend on how long an individual was exposed. For example, for the seven actual sites analyzed, assuming that the uranium mill operates for 10 years, then the lifetime fatal cancer risk to the RMEI would be 3.5×10^{-6} to 3.7×10^{-5}. Alternatively, if it is assumed that an individual was exposed for his/her entire lifetime (i.e., 70 years), then the lifetime fatal cancer risk to the RMEI would be 2.45×10^{-5} to 2.59×10^{-4}. For the two hypothetical generic sites, the lifetime fatal cancer risk to the RMEI would be 4.4×10^{-5} to 9.2×10^{-5} assuming 10 years of mill operation, or 3.1×10^{-5} to 6.44×10^{-5} assuming 70 years of mill operation. The lifetime risk calculation uses only the average radon release results, because while the maximum could occur for a single year, it is unlikely that the maximum would occur for 10 or 70 continuous years.

The study also estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 km of the sites.

4.5 Summary of Radon Risk

This section described the evolution in the understanding of the risk presented by radon and its progeny since the 1989 BID was published. Additionally, the computer code CAP88 Version 3.0 was used to analyze the radon risk from seven operating uranium recovery sites and two generic sites.

The lifetime MIR calculated using data from seven actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments (see Section 2.3.1), while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments (see Section 2.3.2).

In protecting public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}) the lifetime MIR. Although the calculated high end of the lifetime MIR range is above 10^{-4}, the assumptions that radon releases occur continuously for 70 years and that the same RMEI is exposed to those releases for the entire 70 years are very conservative.

Similarly, the risk assessment estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years among the 1.8 million persons living within 80 km of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km of the sites was 0.0043, which was less than one case every 200 years for existing impoundments, and 0.014, or approximately one case every 70 years for new impoundments (see Sections 2.3.1 and 2.3.2).

5.0 EVALUATION OF SUBPART W REQUIREMENTS

The evaluation of Subpart W requirements required analyses of several items to determine if the current technology had advanced since the promulgation of the rule. These topics are listed below, along with the key issues addressed in this report to determine whether the requirements of Subpart W are necessary and sufficient.

5.1 Items Reviewed and Key Issues

Each of these items will be reviewed with reference to the relevant portions of this document:

(1) Review and compile a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed.

Key Issue – The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures and facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

(2) Compare and contrast those technologies with the engineering requirements of hazardous waste impoundments regulated under RCRA Subtitle C disposal facilities, which are used as the design basis for existing uranium byproduct material (i.e., tailings) impoundments.

Key Issue – All new impoundments shall adopt the design and engineering standards referred to through 40 CFR 192.32(a)(1).

(3) Review the regulatory history.

Key Issue – NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.

(4) Tailings impoundment technologies.

Key Issue – The emission limit for impoundments that existed as of December 15, 1989, has been demonstrated to be both achievable and sufficient to limit risks to the levels that were found to protect public health with an ample margin of safety.

The requirement that impoundments opened after December 15, 1989, use either phased or continuous disposal technologies as appropriate to ensure that public health is protected with an ample margin of safety, which is consistent with section 112(d) of the 1990 Amendments of the CAA, which requires standards based on GACT.

(5) Radon measurement methods used to determine compliance with the existing standards.

Key issue – The approved method (Method 115, 40 CFR 61, Appendix B) of monitoring Rn-222 to demonstrate compliance with the emission limit for impoundments that existed as of December 15, 1989, is still valid.

(6) Compare the 1989 risk assessment with current risk assessment approaches.

Key Issue – Adoption of a lower emission limit is not necessary to protect public health, as the current limit has been shown to be protective of human health and the environment. Impact costs associated with the limit are considered to be acceptable.

5.1.1 Existing and Proposed Uranium Recovery Facilities

Sections 3.2, 3.3, and 3.4 describe the three types of uranium recovery facilities: conventional mills, ISL facilities, and heap leach facilities. Each facility type is briefly described below.

Conventional Mills

Section 3 of this report presents a review of the existing and proposed uranium recovery facilities. As indicated, there are five conventional mills at various stages of licensing, with various capacities to receive tailings. Of these five conventional mills, only White Mesa is

operational. Some of these were constructed before December 15, 1989, and fall under the Subpart W monitoring requirement. Table 16 shows the current conventional mills with pre-December 15, 1989 conventional impoundments.

Table 16: Current Pre-December 15, 1989 Conventional Impoundments

Conventional Mill Name	Regulatory Status	Pre-December 15, 1989 Impoundments
Sweetwater	Standby,* license expires November 2014	37 acres not full
Shootaring Canyon	Standby,* license extension May 2013	Only 7 acres of impoundment filled
White Mesa	Active, license expires March 2015	Cell 2 closed, Cell 3 almost full

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

The White Mesa Mill (see Section 3.2.2) has one pre-1989 cell (Cell 3) that is authorized to accept tailings and is still open. Cell 2 is closed. Both cells are monitored for radon flux. The average radon flux for Cell 2 was calculated at 13.5 pCi/(m^2-sec), while that at Cell 3 was 8.9 pCi/(m^2-sec). The mill also uses an impoundment constructed before 1989 as an evaporation pond.

The Sweetwater Mill (see Section 3.2.1) has a 60-acre tailings management area with a 37-acre tailings impoundment of which 28 acres are dry with an earthen cover. The remainder is covered by water. The radon flux from this impoundment is monitored yearly. The average flux (using Method 115) for the entire impoundment was 6.01 pCi/(m^2-sec), including the water-covered area, which had an assumed flux of zero.

The Shootaring Canyon Mill (see Section 3.2.3) had plans for an upper and lower impoundment, but only the upper impoundment was constructed. As the mill operated for approximately 30 days, only about 7 acres of tailings were deposited in the upper impoundment. These have a soil cover. The average radon flux from the covered tailings was measured using Method 115 at 11.9 pCi/(m^2-sec) in April 2010.

The Piñon Ridge Mill (see Section 3.2.4) is a permitted conventional uranium recovery facility in Montrose County, Colorado. The facility has not been constructed; however, there are current activities at the site, including a pre-operational environmental monitoring program.

In-Situ Recovery

As discussed in Section 3.3, ISL was first conducted in 1963 and soon expanded so that by the mid-1980s, a fair proportion of the recovered uranium was by ISL. Table 8shows the ISL facilities in the United States that are currently operational. As previously discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining. Thus, approximately 23 facilities are restarting, expanding, or planning for new operations (see Table 9).

Of particular importance to Subpart W are the impoundments that are an integral part of all ISL facilities. These impoundments are required to maintain the hydrostatic gradient toward the leach

field to minimize excursions referred to as "flare," a proportionality factor designed to estimate the amount of aquifer water outside of the pore volume that has been impacted by lixiviant flow during the extraction phase. While these impoundments typically do not reach the size and scale of conventional tailings piles, they are an integral component of ISL, contain various amounts of radium, and can function as sources of radon gas. Section 3.3.1 provides the mathematical framework for estimating the quantity of radon being emitted from an impoundment. The subsequent discussion of Subpart W, including a proposed standard for impoundments constructed after December 15, 1989, will further evaluate this radon flux.

Heap Leach Facilities

The few commercial heap leach facilities established in the 1980s have been shut down. Recently, however, two heap leach facilities have been proposed: one in Wyoming (Sheep Mountain – Energy Fuels) and one in New Mexico (Grants Ridge, Uranium Energy Corporation) (see Section 3.4). If the price of uranium increases, then recovery of uranium from heap-leaching low-grade ores will become economically attractive and will likely lead to additional facilities. The question to be addressed from the standpoint of Subpart W is the radon flux released from the active heap leach pile. Also, once the uranium is removed from the ore in the heap leach pile, the spent ore becomes a byproduct material much like the tailings, albeit not mobile. This spent ore contains radium that releases radon. As the heap leach pile is constructed to allow lixiviant to "trickle through" the pile, these same pathways could allow for radon release by diffusion out of the spent ore and then through the pile, which is addressed under Subpart W.

5.1.2 RCRA Comparison

Both alternative disposal methods presented in Subpart W (work practices) require that tailings impoundments constructed after December 15, 1989, meet the requirements of 40 CFR 192.32(a)(1). Tailings impoundments include surface impoundments, which are defined in 40 CFR 260.10:

> *Surface impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.*

The above definition encompasses conventional tailings ponds, ISL ponds, and heap leach piles. The last is included as it is assumed that the heap leach pile will be diked or otherwise constructed so as not to lose pregnant liquor coming from the heap.

This being the case, 40 CFR 264.221(a) states that the impoundment shall be designed and constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Requirements of the liner system listed in 40 CFR 264.221(c) include:

(1)(i)(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life.

(1)(i)(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 ft (91 centimeters (cm)) of compacted soil material with a hydraulic conductivity of no more than $1{\times}10^{-7}$ centimeters per second (cm/sec).

The regulation also requires a leachate collection system:

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system.* This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period.

Other requirements for the design and operation of impoundments, given in 40 CFR 264 Subpart K, include construction specifications, slope requirements, and sump and removal requirements. The above requirements are important to new uranium containment/impoundment systems because of the potential that water will be used to limit the radon flux from a containment/impoundment. Thus, it is also important to minimize the potential for ground water or surface water contamination. For conventional mill tailings impoundments, the work practices require a soil cover. With heap leach piles, the moisture in the heap would limit radon during operations, and after operations, a degree of moisture would be required to ensure that the radon diffusion coefficient is kept low (see Section 5.4).

5.1.3 Regulatory History

Section 2.0 reviewed the regulatory history of Subpart W. This review indicates that NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator’s duty under the CAA. The following presents the use of GACT (see Section 5.3) in detail and describes its use in conventional and other than conventional uranium recovery.

5.1.4 Tailings Impoundment Technologies

Sections 2.3.1 and 2.3.2 discuss tailings impoundment technologies. The two primary changes to the technology as it was previously practiced were first that owners and/or operators of conventional mill tailings impoundments must meet the requirements of 40 CFR 192.32(a)(1) and second that they must adhere to one of the two work practices previously discussed (for

impoundments constructed after December 15, 1989). Within these limits, tailings impoundment technologies have had no fundamental changes.

5.1.5 Radon Measurement Methods

As previously described, Subpart W defines two separate standards. The first states that existing sources (as of December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA that shows the results of the compliance monitoring (see Section 3.5). As pointed out in Appendix B, the focus of the monitoring was on the beaches, tops, and sides of conventional piles. The radon flux from the water-covered portion of the tailings pile was assumed to be zero. Although regulated under Subpart W, it is unclear how to monitor the radon flux off the surface of evaporation ponds at conventional mills, ISLs, or heap leach facilities. Since these ponds are considerably smaller than tailings impoundments, the solution was to specify that as long as the water cover is 1 meter or more during the active life of the pond, no monitoring is necessary (see Section 3.3.1).

Section 3.3.1 also shows that, for evaporation ponds at ISL facilities, the radon flux from the surface is a function of the wind speed and the concentration of radium in the water. Estimates using actual ISL data showed the contribution to the sites' total radon release to be less than 1% of the total. In any case, the radon flux can also be reduced by co-precipitating the radium using barium chloride ($BaCl_2$) co-precipitation treatment to reduce the radium concentration.

For impoundments constructed on or after December 15, 1989, monitoring is not required. Rather, Subpart W requires that these impoundments comply with one of two work practice standards: the first practice limits the size of the impoundment to 40 acres or less, which limits the radon source, while the second practice of continuous disposal does not allow uncovered tailings to accumulate in large quantities, which also limits radon emissions.

For evaporation ponds or holding ponds as in the pre-December 15, 1989, case, a 1-meter cover of water should be sufficient to limit the radon flux to the atmosphere (see Section 3.3.1). Thus, the proposed GACT is that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size or area restriction, and that during the active life of the pond at least 1 meter of liquid be maintained in the pond.

The last facility is the potential heap leach pile. Subpart W applies to the material in the pile as byproduct material is being generated. Considering a small section of the pile as the leach (acid or base) solubilizes the uranium, the material left is byproduct material. The result is a material similar to tailings and the heap is also wet. It is assumed that if the moisture content is greater than 30%, the heap is not dewatered. As long as the heap is not dewatered, the radon diffusion coefficient is such that minimal radon will escape the heap leach pile.

Heap Leach Radon Flux

A possible source of radon from a heap leach pile is from the surface of the pile. Assuming that the heap pile is more than 1 or 2 meters thick, the radon flux from this configuration can be estimated from the following formula (NRC 1984):

$$J = 10^4 R \rho E \sqrt{\lambda D_e} \qquad (5\text{-}1)$$

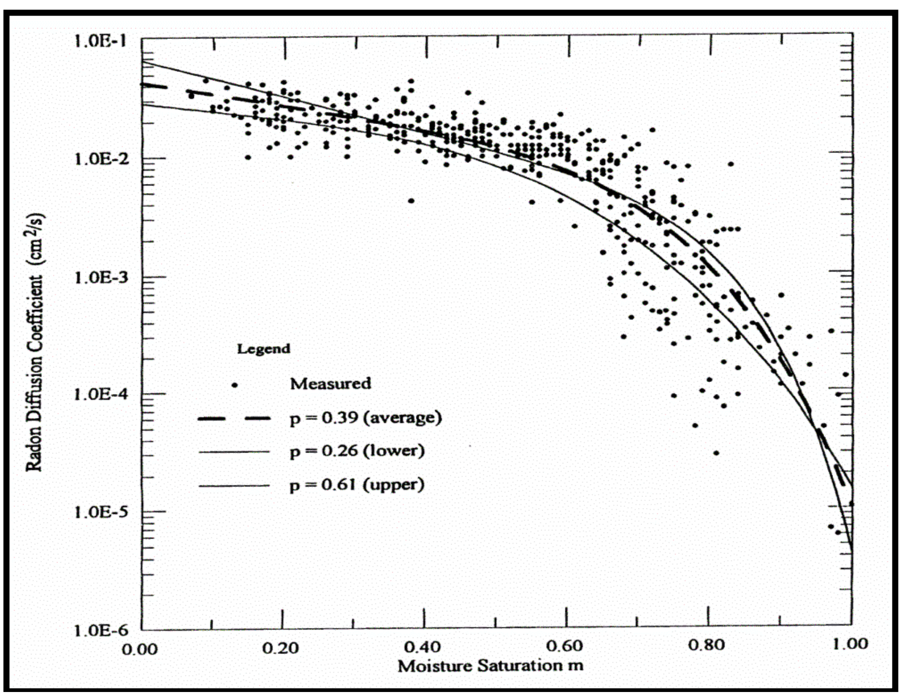
Where

J = radon flux (pCi/(m^2-sec))
10^4 = units conversion (cm^2/m^2)
R = specific activity of radium (pCi/g)
ρ = dry bulk density of material (1.8 g/cc)
E = emanation coefficient
λ = radon decay constant (2.11×10^{-6} sec^{-1})
D_e = radon diffusion coefficient (cm^2/sec)

$$= D_0\, p\, exp[-6\, m\, p - 6\, m^{14\, p}] \qquad (5\text{-}2)$$

D_0 = radon diffusion coefficient in air (0.11 cm^2/sec)
m = moisture saturation fraction
p = total porosity

The above empirical expression for the radon diffusion coefficient was developed by Rogers and Nielson (1991), based on 1,073 diffusion coefficient measurements on natural soils. Figure 13 shows that the diffusion coefficient calculated using the empirical expression agrees well with the measured data points over the whole range of moisture saturation at which diffusion coefficient measurements were made.



Source: Rogers and Nielson 1991, as reported in Li and Chen 1994

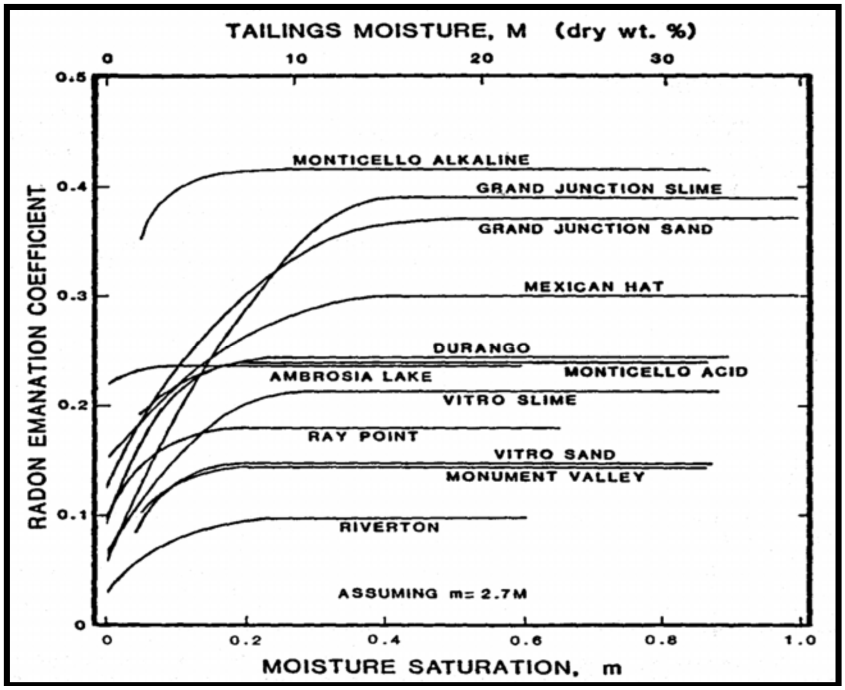
Figure 13: Diffusion Coefficient as a Function of Moisture Saturation

Figure 13 also demonstrates that as the moisture increases, the radon diffusion coefficient decreases significantly. This is because radon diffuses 10,000 times more slowly in water than it does in air (Drago 1998, as reported in Brown 2010). Therefore, adding moisture to the radium-containing material (whether it be a tailings pile or a heap pile) would decrease the diffusion coefficient, thereby increasing the time it takes for radon to diffuse out of the material and allowing more radon to decay before it can be released. As Figure 13 shows, the decrease in the radon diffusion coefficient can be significant, especially at high moisture levels.

However, in addition to the radon diffusion coefficient, the radon emanation coefficient is sensitive to the amount of moisture present. When a radium atom decays, one of three things can happen to the resulting radon atom: (1) it may travel a short distance and remain embedded in the same grain, (2) it can travel across a pore space and become embedded in an adjacent grain, or (3) it is released into a pore space. The fraction of radon atoms released into the pore space is termed the "radon emanation coefficient" (Schumann 1993). As soil moisture increases, it affects the emanation coefficient by surrounding the soil grains with a thin film of water, which slows radon atoms as they are ejected from the soil grain, increasing the likelihood that the radon atom will remain in the pore space. Research by Sun and Furbish (1995) describes this relationship between moisture saturation and the radon emanation rate:

> *The greater the moisture saturation is, the greater the possible radon emanation rate is. With moisture contents from 10% up to 30%, the recoil emanation rates quickly reach the emanation rate of the saturated condition. As the moisture reaches 30%, a universal thin film on the pore surface is formed. This thin film is sufficient to stop the recoil radon from embedding into another part of the pore wall.*

Figure 14 shows that the radon emanation coefficient can vary considerably for different tailings piles. Figure 14 also agrees with Sun and Furbish (1995) in that it shows that the emanation coefficient tends to level off when the moisture saturation level is above approximately 30%.



Source: NRC 1984

Figure 14: Emanation Coefficient as a Function of Moisture Content and Moisture Saturation

In conclusion, a moisture saturation level of up to about 30% tends to increase the radon emanation coefficient and decrease the radon diffusion coefficient, such that the amount of radon released from the pile could increase with increasing moisture. Above about 30% moisture saturation, the radon emanation coefficient is unchanged by increasing moisture, while the radon diffusion coefficient continues to decrease. Figure 15 shows the total effect of moisture on the radon flux. Equation 5-1 was used to develop Figure 15, along with the Rogers and Nielson (1991) empirical equation for the diffusion coefficient, an approximation of the Vitro Sand emanation coefficient from Figure 14, and a porosity of 0.39. Figure 15 does not show the radon flux values, since they would vary depending on the radium concentration and would not affect the shape of the curve.

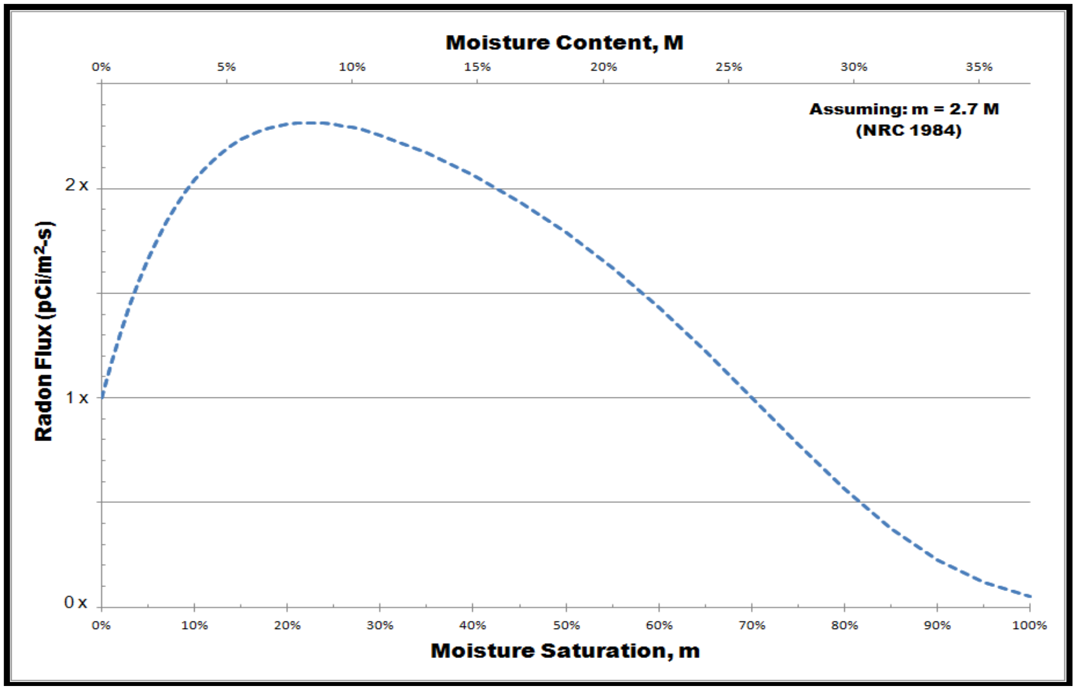


Figure 15: Radon Flux as a Function of Moisture Saturation and Moisture Content

Figure 15 shows that the radon flux starts low and increases as the moisture saturation increases due to the emanation coefficient. At between 20% and 30% moisture saturation, the flux reaches a peak that is about 2½ times the flux at zero moisture, after which the diffusion coefficient takes control and the flux decreases. Figure 15 is consistent with the results reported by Hosoda et al. (2007) in their study of the effect of moisture on the emanation of radon and thoron gases from weathered granite soil:

> *A sporadic increase in the radon and thoron exhalation rates was caused by the increase in the moisture content up to 8%* [27% moisture saturation]. *However, the exhalation rates showed a decreasing tendency with the increase in moisture content over 8%…, both measured and calculated radon exhalation rates had similar trends with an increase in the moisture content in the soil.*

The final point from Figure 15 is that the radon flux with a moisture content of 70% or greater is less than the flux at zero moisture, and that with a porosity of 0.39, 70% moisture saturation is equivalent to 27% moisture by weight. Thus, 30% moisture by weight would result in a radon flux significantly below the zero moisture flux.

5.1.6 Risk Assessment

Section 4.4 presents the results of a risk assessment performed for seven actual uranium recovery sites plus two generic uranium recovery sites. This risk assessment used the CAP88 Version 3.0 analytical computer model, which, as described in Section 4.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Additionally, this assessment used the latest radon dose and risk coefficients (i.e., millirem

(mrem)/picocurie (pCi) and LCF/pCi) from FGR 13. Both the 1989 assessment and this assessment used site-specific meteorological data. This assessment used 2000 census data, updated to 2010, whereas the 1989 assessment used 1983 data. Finally, as stated above, this assessment used actual historical radon releases from the uranium recovery sites, whereas because of the lack of site-specific data, the 1989 assessment assumed a radon release rate based on 1 pCi/(m^2-sec) Rn-222 emitted per pCi/g Ra-226 during both the operating, standby, drying, and/or disposal phase, and either 20 pCi/(m^2-sec) or the design flux (if known) during the post-disposal phase.

Section 4.4 presents the doses and risks calculated by the current risk assessment, and Section 4.5summarizes them. Additional information on the current risk assessment appears in SC&A 2011.

5.2 Uranium Recovery Source Categories

The preceding items and key issues are the basis for categorizing the major uranium recovery methods that will lead to methods of reducing radon emissions. The next section, which addresses the GACT standard, further discusses the applicability of the control measures. The following source categories represent a logical breakdown of the current uranium recovery industry:

Conventional Impoundments – Conventional impoundments are engineered structures for storage and eventual permanent disposal of the fine-grained waste from mining and milling operations (i.e., tailings). All conventional uranium recovery mills have one or more conventional impoundments. Table 3 shows conventional uranium milling facilities that are either built or licensed. This category will also include future conventional milling facilities.

Nonconventional Impoundments – At nonconventional tailings impoundments, tailings (byproduct material) are contained in ponds and covered by liquids. These impoundments are normally called “evaporation ponds” or “holding ponds.” Nonetheless, they contain byproduct material and, as shown in Section 3.3.1, can generate radon gas. This category is usually associated with ISL facilities (i.e., process waste water resulting from ISL operations (see Section 3.3)), but can also be associated with conventional facilities or heap leach facilities. While these ponds do not meet the work practices for conventional mills, they still must meet the requirements of 40 CFR 192.32(a)(1).

Heap Leach Piles – While no heap leach facilities are currently operating in the United States, at least one potential operation is expected to go forward (see Section 3.4). Heap leach piles contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct. As stated above, the design and operation of the heap leach is expected to follow the requirements of 40 CFR 192.32(a)(1).

5.3 The GACT Standard

Section 112(d) of the CAA requires EPA to establish NESHAPs for both major and area sources of HAPs that are listed for regulation under CAA section 112(c). Section 112(c) lists

radionuclides, including radon, as a HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for regulation of emissions of HAP. A "major source," other than for radionuclides, is defined as any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, in the aggregate, 10 tons per year or more of any HAP. For radionuclides, major source shall have the meaning specified by the Administrator by rule. An area source is a stationary source that is not a major source.

The regulation of HAPs at major sources is dictated by the use of MACT. Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating a MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

In 2000, EPA provided guidance to clarify how to apply the major source threshold for HAPs as defined in section 112(b) of the CAA Amendments of 1990. The guidance stated how to apply the major source threshold specifically for radionuclides:

> *There have been some questions about determining the major source threshold for sources of radionuclides. Section 112(a)(1) allows the Administrator to establish different criteria for determining what constitutes a major source of radionuclides since radionuclides emissions are not measured in units of tons. This, however, would not preclude a known radionuclide emitter that is collocated with other HAP-emitting activities at a plant site from being considered a major source due to the more common, weight-based threshold. The July 16, 1992, source category list notice did not include any sources of radionuclides because no source met the weight-based major source threshold, and the Agency had not defined different criteria. At the current time, there remain no listed major source categories of radionuclide emissions.* [EPA 2000b]

Based on this guidance, radon emissions from uranium recovery facility tailings impoundments are not a major source, and therefore, they are area sources for which the GACT standard is applicable. Unlike MACT, the meaning of GACT, or what is "generally available" is not defined in the act. However, section 112(d)(5) of the CAA Amendments for 1990 authorizes EPA to:

> *Promulgate standards or requirements applicable to [area] sources…which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.*

The Senate report on the legislation (U.S. Senate 1989) provides additional information on GACT and describes it as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic*

impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. Also considered are the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are also reviewed to determine whether such technologies and practices can be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

Thus, as presented above, "Promulgate standards or requirements … " does not limit EPA to strict "standard setting" in order to provide for the use of GACT. Rather, it allows EPA to promulgate at least two types of rules: rules that set emission levels based on specific controls or management practices (this is analogous to the MACT standard setting), and rules that establish permitting or other regulatory processes that result in the identification and application of GACT standards.

5.4 Uranium Recovery Categories and GACT

For conventional impoundments, the 1989 promulgation of Subpart W contained two work practice standards, phased disposal and continuous disposal (see Section 2.0, page 7). The work practice standards limit the size and number of the impoundments at a uranium recovery facility in order to limit radon emissions. The standards cannot be applied to a single pile that is larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). This approach was taken in recognition that the radon emissions from these impoundments could be greater if the piles were left dry and uncovered. The 1989 Subpart W also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for preventing and mitigating ground water contamination.

As discussed earlier, it is no longer believed that a distinction needs to be made for conventional impoundments based on the date when they were design and/or constructed. The existing impoundments at both the Shootaring Canyon (Section 3.2.3) and Sweetwater (Section 3.2.1) facilities can meet the work practice standards in the current Subpart W regulation. Impoundments at both these facilities have an area of less than 40 acres and are synthetically lined as required in 40 CFR 192.32(a). Also, the existing Cell 3 at the White Mesa mill will be closed in 2012 and replaced with impoundments that meet the phased disposal work practice standard (Section 3.2.2). Therefore, there is no reason not to apply the work practice standards required for impoundments designed or constructed after December 15, 1989, to these older impoundments. By incorporating these impoundments under the work practice standards, the requirement of radon flux testing is no longer needed and will be eliminated.

For the proposed GACT, the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards were evaluated. Liner requirements in use for the permitting of hazardous waste land disposal units under RCRA are contained in 40 CFR 264.221. Since 40 CFR 192.32(a)(1) references 40 CFR 264.221, it is the only requirement necessary for Subpart W, as the RCRA requirements are effective methods of containing tailings and protecting ground water while also limiting radon emissions. The regulation in 40 CFR 264.221 contains safeguards to allow for the placement of tailings and also provides for an early warning system in the event of a leak in the liner system. Therefore, the proposed GACT for conventional impoundments retains the two work practice standards and the requirements of 40 CFR 192.32(a)(1), because they have proven to be effective methods for limiting radon emissions while also protecting ground water. The NRC considers the requirements of 40 CFR 192.32(a) in its review during the licensing process.

For nonconventional impoundments, where tailings (byproduct material) are contained in ponds and covered by liquids, a new GACT is proposed. These facilities, called “evaporation ponds” or “holding ponds,” also must meet the requirements of 40 CFR 192.32(a)(1). Specifically, these are the design and operating requirements for the impoundments. Because of the general experience that a depth of greater than 1 meter of liquid essentially reduces the radon flux of ponds to negligible levels, no monitoring is required for this type of impoundment. Given these factors, the following GACT is proposed:

> Nonconventional impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

For the last category, heap leach piles, an approach similar to that for nonconventional impoundments is proposed. As previously noted, these facilities contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct material, which is regulated under Subpart W. As for nonconventional impoundments, the design and operation of the heap leach pile is expected to follow the requirements of 40 CFR 192.32(a)(1). This also will prevent the loss of pregnant liquor (lixiviant with dissolved uranium) from spillage or leakage.

The byproduct material that makes up the volume of the spent heap leach pile is typically wet. As Figure 15 shows, as material goes from dry to wet the radon flux first increases before it decreases (the reasons for this are discussed in Section 5.1.5). While it is impossible to maintain a completely wet state, it is possible to maintain a sufficient percentage of moisture content to meet a goal that the radon flux in the wetted material is below what the flux would be if the material was dry. This percentage is related to the state or material being “dewatered.” By way of definition, 40 CFR 61.251(c) states:

> Dewatered *means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight.*

Thus, the proposed GACT for heap leach piles is that, in addition to meeting 40 CFR 192.32(a)(1), operating heap leach piles must maintain a moisture content greater than

30% (equivalent to about 70% to 80% moisture saturation, as described in Section 5.1.5). This would, as indicated, ensure that the radon flux from the surface of the pile is quite low, i.e., at or below what the flux would be if the material in the pile was dry.

Since the purpose of this GACT is to control the radon emissions, it may not be critical to maintain the 30% moisture content in the lower levels/lifts of the pile. The reason for this is two-fold; first, radon generated in the lower levels would have to travel further in the pile before it would escape to the atmosphere, thereby giving it more time to decay within the pile, and second, radon from the lower layers will be slowed due to the 30% moisture content in the upper levels. Additionally, if inter-lift liners are provided when the pile is composed of multiple lifts, the inter-lift liner would act as a barrier to radon from the lower lifts, and thus mitigate the need for those lower lifts to maintain the 30% moisture content. On the other hand, because radon emission do not stop when active uranium leaching has ceased, it will be necessary to continue wetting the pile to maintain the 30% moisture content until a final reclamation cover (including a radon barrier layer) has been constructed over the pile.

5.5 Other Issues

During the review of Subpart W, several additional issues were identified. These are identified and discussed in this section.

5.5.1 Extending Monitoring Requirements

In reviewing Subpart W, EPA examined whether radon monitoring should be extended to all impoundments constructed and operated since 1989 so that the monitoring requirement would apply to all impoundments containing uranium byproduct material (i.e., tailings). EPA also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. As the rule currently exists, only pre-1989 conventional tailings impoundments are required to monitor for radon emissions, the requirement being an average flux rate of not more than 20 pCi/(m^2-sec). This is because, at the time of promulgation of the 1989 rule, EPA stated that the proposed work practice standards would be effective in reducing radon emissions from operating impoundments. Since the work practice standards could not be applied to pre-1989 facilities, and since EPA determined that it is not feasible to prescribe an emissions standard for radon emissions from a tailings impoundment (54 FR 9644 (FR 1989a)), the improved work practice standards would limit radon emissions by limiting the amount of tailings exposed.

Thus, it is not necessary to require radon monitoring at facilities constructed after the current Subpart W was promulgated (i.e., December 15, 1989). With respect to tailings and the amount of water used to cover them, the work practice standards (now proposed as GACTs) are also protective in preventing excess radon emissions. Further, for nonconventional impoundments, where there is no applicable radon monitoring method, the standing liquid requirement will effectively prevent all radon emissions from holding or evaporation ponds.

5.5.2 Clarification of the Term "Operation"

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement [which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W]. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

> <u>Operation.</u> Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

5.5.3 Clarification of the Term "Standby"

In the past, there has been confusion as to whether the requirements of Subpart W apply to a uranium recovery facility that is in "standby" mode. Although not formally defined in Subpart W, "standby" is commonly taken to be the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations. This period usually takes place when the price of uranium is such that it may not be cost effective for the facility to continue operations, and yet the facility fully intends to operate once the price of uranium rises to a point where it is cost effective for the facility to re-establish operations. As shown in Table 3, the Sweetwater and Shootaring Canyon mills are currently in standby. While in standby, a uranium recovery facility can change its license from an operating license to a possession only license, thereby reducing its regulatory obligations (and costs).

The addition of the following definition of "closure" into the Subpart W definitions at 40 CFR 61.251 would eliminate confusion:

> <u>Standby</u>. Standby means the period of time that a facility may not be accepting new tailings, but has not yet entered closure operations.

5.5.4 The Role of Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these western regions, the annual average precipitation (see Figure 16) falling on the impoundment is less than the annual average evaporation (see Figure 17) from the impoundment. Also, these facilities are located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. However, recent uranium exploration in the United States shows the potential to move eastward, into more climatologically temperate regions of the country. South central Virginia is now being considered for a conventional uranium mill (e.g., the Coles Hills, see Table 4). To determine whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

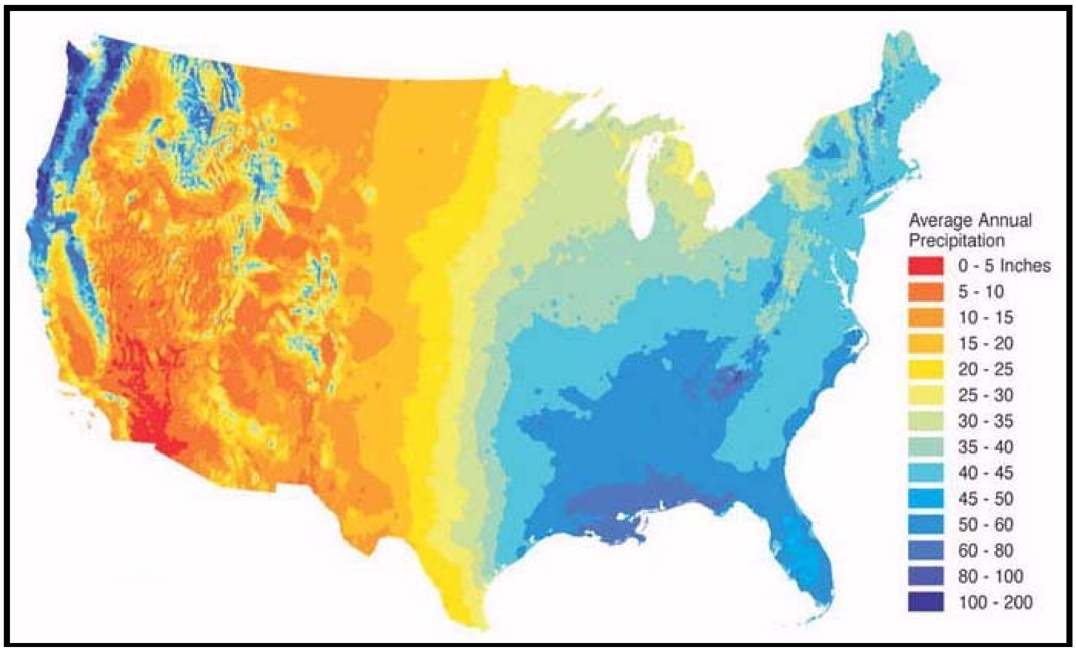


Figure 16: U.S. Average Annual Precipitation

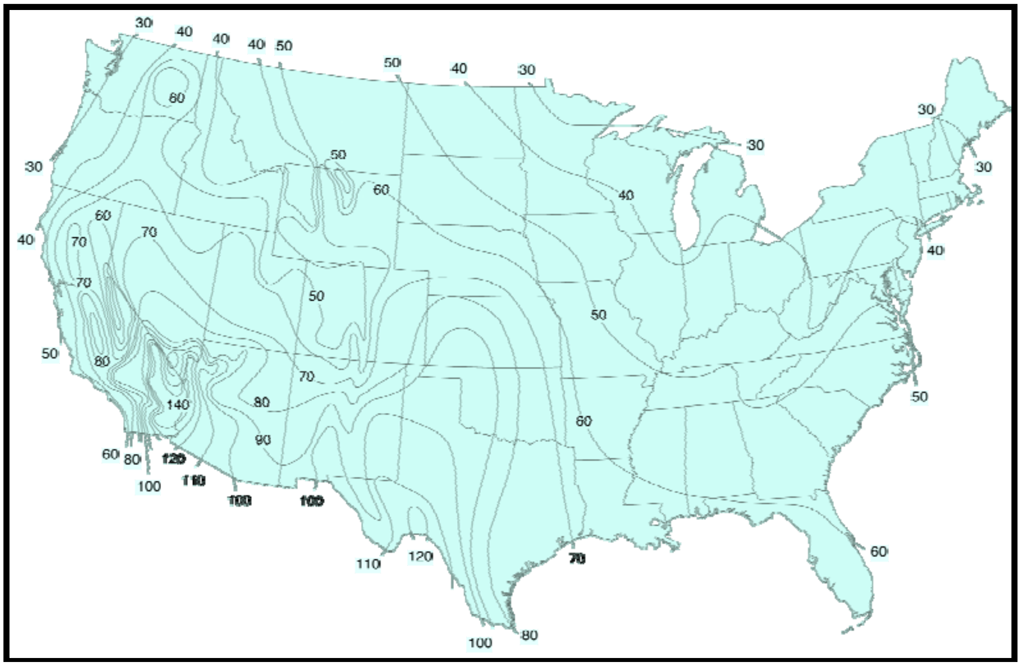


Figure 17: U.S. Mean Annual Evaporation

Subpart W requires owners and operators of uranium tailings impoundments to follow the requirements of 40 CFR 192.32(a). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that can be used to ensure proper operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action; rainfall; run-on; malfunctions of level controllers, alarms and other equipment; or human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive dike failure. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Uranium recovery facilities are already operating under the requirements of 40 CFR 192.32(a)(1), including compliance with 40 CFR 264.221(g) and (h), which will provide protection against the weather events likely to occur in the eastern United States.

6.0 ECONOMIC IMPACTS ASSOCIATED WITH REVISION/MODIFICATION OF THE SUBPART W STANDARD

This section contains the following economic impact analyses necessary to support any potential revision of the Subpart W NESHAP:

- Section 6.1 provides a review and summary of the original 1989 economic assessment and supporting documents.
- The baseline economic costs for development of new conventional mills and ISL and

heap leach facilities are developed and presented in Section 6.2.

- Section 6.3 presents the anticipated industry costs versus environmental and public health benefits to be derived from each of the four proposed GACT standards.

- Finally, Section 6.4 provides demographic data regarding the racial and socioeconomic composition of the populations surrounding uranium recovery facilities.

To assess the economic impacts of potential revisions to the Subpart W NESHAP, capital costs (including equipment costs), labor costs, taxes, etc., were obtained from actual recent cost estimates that have been prepared for companies planning to design, develop, construct, and operate uranium recovery facilities. For ISL facilities, two recent cost estimates were used as the basis for this analysis, while for conventional mills and heap leach facilities, a single cost estimate was used for each type of facility. Other necessary data, such as a discount rate, borrowing, and interest rates, were assumed, as described in Section 6.2.

Where feasible and appropriate, the economic models and recommendations from EPA's "Guidelines for Preparing Economic Analyses" (EPA 2010) were followed in assessing these economic impacts.

The cost and economic impact estimates described in Section 6.2 and 6.3 are based on industry data compiled in 2010-2011. Therefore, some of the analytical input values would differ somewhat if they were updated to reflect the latest information available. For example, the current long-term market price of uranium is approximately 17 percent lower than the $65 estimate that is used in the analysis (Cameco, 2013). The uranium mining industry is currently experiencing a volatile period resulting from the aftereffects of the Fukushima nuclear disaster. In particular, uranium demand has suffered from nearly all of Japan's workable reactors remaining offline since the March 2011 earthquake and tsunami triggered multiple meltdowns at the Fukushima Dai-ichi plant. Given the atypical post-Fukushima uranium market situation of the last couple of years and the prospects for a return to more normal market activity in the mid-term future,[7] we have decided not to update the analysis to incorporate the latest industry data. The results of the analyses described in this section are judged to be realistic estimates of the mid- to long-term impacts of the proposed Subpart W NESHAP.

6.1 1989 Economic Assessment

When Subpart W was promulgated in 1989, EPA performed both an analysis of the standard's benefits and cost and an evaluation of its economic impacts. Those analyses appear in the 1989 BID, Volume 3, Sections 4.4 and 4.5 (EPA 1989). This section briefly summarizes the Subpart W economic assessments performed in 1989.

[7]These prospects include: the conclusion of the U.S.-Russia program that annually removes 24 million pounds of ex-military highly enriched uranium from the market via down-blending for use as U.S. nuclear fuel; the 60 nuclear power plants that are currently under construction throughout the world; efforts to reduce climate change emissions; and expectations that Japan will slowly begin restarting its 50 nuclear plants.

In these 1989 assessments, EPA evaluated the benefits and costs associated with three separate decisions. The first decision concerned a limit on allowable radon emissions after closure. The options evaluated included reducing radon emissions from the 20 pCi/(m^2-sec) limit to 6 pCi/(m^2-sec) and 2 pCi/(m^2-sec).

The second decision that EPA investigated was the means by which the emissions from active mills could be reduced to the 20 pCi/(m^2-sec) limit while operations continue. Emissions could be reduced by applying earth and water covers to portions of the dry areas of the tailings piles, which could reduce average radon emissions for the entire site to the 20 pCi/(m^2-sec) limit.

While the first two decisions were focused on tailings piles that existed at the time the standard was promulgated, the third concerned future tailings impoundments. EPA evaluated alternative work practices for the control of radon emissions from operating mills in the future. Options investigated include the replacement of the traditional single-cell impoundment (i.e., the 1989 baseline) with phased disposal or continuous disposal impoundments.

6.1.1 Reducing Post-Closure Radon Emissions from 20 pCi/(m^2-sec)

The 1989 BID estimated the total annual tailings piles radon emissions for standards of 20, 6, and 2 pCi/(m^2-sec) and calculated the cancers that could result from those emissions. It found that over a 100-year analysis period, the 6 pCi/(m^2-sec) option could lower local and regional risks by 3.6 cancers, while the incremental benefit of lowering the allowable flux rate from 6 to 2 pCi/(m^2-sec) was estimated at 1.0 cancer.

The increased costs associated with reducing the allowable flux rate from 20 to 6 pCi/(m^2-sec) were estimated to be between $113 and $180 million (1988$) ($205 and $327 million (2011$)), while attainment of a 2 pCi/(m^2-sec) flux rate was estimated to result in added costs of $216 to $345 million (1988$) ($393 to $627 million (2011$)).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. As the following excerpt from the preamble to the standard shows, for tailings piles at operating mills, EPA's decision was based on the very low risks associated with 20 pCi/(m^2-sec), rather than on a comparison of the benefits versus the costs of the alternative emission standards:

> *... the risks from current emissions are very low. A NESHAP requiring that emissions from operating mill tailings piles limit their emissions to no more than 20 pCi/(m^2-sec) represents current emissions. EPA has determined that the risks are low enough that it is unnecessary to reduce the already low risks from the tailings piles further.* [FR 1989a, page 51680]

While for tailings impoundments at inactive mills, the preamble presented a quantitative cost-benefit comparison as justification for maintaining the radon emission level at 20 pCi/(m^2-sec):

EPA examined these small reductions in incidence and maximum individual risk and the relatively large costs of achieving Alternative II [6 pCi/(m^2-s)]*, $158 million capital coat and $33 million in annualized costs and determined that Alternative I* [20 pCi/(m^2-s)] *protects public health with an ample margin of safety.* [FR 1989a, page 51682]

6.1.2 Reducing Radon Emissions During Operation of Existing Mills

The 1989 BID estimated the reduction in total risk that could be obtained by reducing radon emissions from active mills operating at that time to 20 pCi/(m^2-sec) through the application of an earthen cover and/or by keeping the tailings wet. The 1989 BID, Table 4-41, reported the risk reduction to be 0.17 fatal cancers for all active mills over their assumed 15-year operational life.

The 1989 BID, Table 4-42B, reported that the cost for providing the earthen covers and for keeping the tailings wet over the 15-year operating period was estimated to be $13.166 million (1988$) ($23.94 million in 2011$).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. EPA nonetheless decided that without these standards the risks were too high, as the following segment from the preamble to the standard indicates:

… EPA recognizes that the risks from mill tailings piles can increase dramatically if they are allowed to dry and remain uncovered. An example of how high the risks can rise if the piles are dry and uncovered can be seen in the proposed rule, 54 FR 9645. That analysis assumed that the piles were dry and uncovered and the risks were as high as 3×10^{-2} with 1.6 fatal cancers per year. Therefore, EPA is promulgating a standard that will limit radon emissions to an average of 20 pCi/m^2-s. This rule will have the practical effect of requiring the mill operators to keep their piles wet or covered. … [FR 1989a, page 51680]

6.1.3 Promulgating a Work Practice Standard for Future Tailings Impoundments

Section 4.4.3.1 of the 1989 BID provides the following explanations of the phased and continuous disposal options:

Phased Disposal

The first alternative work practice which is evaluated for model new tailings impoundments is phased disposal. In phased or multiple cell disposal, the tailings impoundment area is partitioned into cells which are used independently of other cells. After a cell has been filled, it can be dewatered and covered, and another cell used. Tailings are pumped to one initial cell until it is full. Tailings are then pumped to a newly constructed second cell and the former cell is dewatered and then left to dry. After the first cell dries, it is covered with earth obtained from the construction of a third cell. This process is continued sequentially. This system

minimizes emissions at any given time since a cell can be covered after use without interfering with operations as opposed to the case of a single cell.

Phased disposal is effective in reducing radon-222 emissions since tailings are initially covered with water and finally with earth. Only during a drying-out period of about 5 years for each cell are there any [significant] *radon-222 emissions from the relatively small area. During mill standby periods, a water cover could be maintained on the operational cell. For extended standby periods, the cell could be dewatered and a dirt cover applied.*

Continuous Disposal

The second alternative work practice, continuous disposal, is based on the fact that water can be removed from the tailings slurry prior to disposal. The relatively dry dewatered (25 to 30% moisture [by weight]*) tailings can then be dumped and covered with soil almost immediately. No extended drying phase is required, and therefore very little additional work would be required during final closure. Additionally, ground water problems are minimized.*

To implement a dewatering system would introduce complications in terms of planning, design, and modification of current designs. Acid-based leaching processes do not generally recycle water, and additional holding ponds with ancillary piping and pumping systems would be required to handle the liquid removed from the tailings. Using trucks or conveyor systems to transport the tailings to disposal areas might also be more costly than slurry pumping. Thus, although tailings are more easily managed after dewatering, this practice would have to be carefully considered on a site-specific basis.

Various filtering systems such as rotary vacuum and belt filters are available and could be adapted to a tailings dewatering system. Experimental studies would probably be required for a specific ore to determine the filter media and dewatering properties of the sand and slime fractions. Modifications to the typical mill ore grinding circuit may be required to allow efficient dewatering and to prevent filter plugging or blinding. Corrosion-resistant materials would be required in any tailings dewatering system due to the highly corrosive solutions which must be handled. ...

The committed fatal cancer risk[8] from the operation of model baseline (single-cell), phased disposal, and continuous disposal impoundments, as determined by the 1989 BID, is shown in Table 17. Table 17 shows the following:

[during] *the operational period the risk of cancer is reduced, relative to the single cell baseline, by 0.129 if phased disposal is adopted and by 0.195 if the continuous single cell method is used. The risk reduction associated with using the continuous single cell relative to the phased approach is 0.066. In the post-operational phase, phased disposal raises the risk by 0.012 relative to the*

[8] "Committed fatal cancer risk" is the likeliness that an individual will develop and die from cancer at some time in the future due to their current exposure to radiation. "Committed fatal cancer risk" is sometimes referred to as "latent cancer fatality risk."

baseline, while the continuous single cell approach lowers it by 0.017 relative to the baseline and by 0.028 relative to phased disposal. [EPA 1989, Section 4.4.3.3]

Table 17: Radon Risk Resulting from Alternative Work Practices (Committed Cancers)

	Baseline (Single Cell)	Phased Disposal	Continuous Disposal
Operational Period (0 to 20 years)	0.282	0.153	0.087
Post-Operations (21 to 100 years)	0.264	0.276	0.247
Total	0.546	0.429	0.334

Source: EPA 1989, Table 4-45

Concerning the cost to implement the work practices, the 1989 BID indicates the following:

> *the phased … disposal impoundment is the most expensive design ($54.02 million* [1988$]*), while the single cell … impoundment ($36.55 million* [1988$]*) is the least expensive. Costs for the continuous single cell design ($40.82 million* [1988$]*) are only slightly more than those of the single cell impoundment, although the uncertainties surrounding the technology used in this design are the largest*. [EPA 1989, Section 4.4.3.4]

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. However, as the following excerpt from the preamble to the standard shows, EPA was concerned about the uncertainty of the benefits and costs analysis that had been performed for this portion of the regulation. Ultimately, the Agency based its decision on the small cost to implement the work practices, rather than on weighing the benefits versus the costs:

> *The uncertainty arises because it assumes a steady state industry over time. If the uranium market once again booms there would be increased risks associated with Alternative I* [one large impoundment (i.e., baseline)]. *If the industry then experienced another economic downturn, the costs of Alternative I would increase because of the economic waste that occurs when a large impoundment is constructed and not filled. The risks can also increase if a company goes bankrupt and cannot afford the increased costs of closing a large impoundment and the pile sits uncovered emitting radon. The risks can also increase if many new piles are constructed, creating the potential for the population and individual risks to be higher than EPA has calculated.*
>
> *These uncertainties significantly affect the accuracy of the* [benefits and costs] *analysis and given the small cost of going to Alternatives II* [phased disposal] *and III* [continuous disposal]*, EPA has determined that in order to protect the public*

with an ample margin of safety, both now and in the future, new mill tailings impoundments must use phased or continuous disposal. [FR 1989a, page 51680]

6.1.4 Economic Impacts

To determine the economic impacts of the proposed Subpart W on the uranium production industry, the 1989 BID evaluated two extreme cases; in the first, it was assumed that "no portion of the cost of the regulation can be passed on to the purchaser of U_3O_8," and in the second, it was "assumed that the uranium production industry is able to recover the entire increase in the tailings disposal cost by charging higher U_3O_8 prices." These two cases provided the lower and upper bound, respectively, of the likely economic impacts of Subpart W on the uranium production industry.

As described in Section 3.1, from 1982 to 1986, the uranium production industry had been contracting and experiencing substantial losses because of excess production capacity. The 1989 Subpart W economic impact assessment concluded that if the industry had to absorb the costs of implementing the regulation, the present value cost at that time would be about five times the industry losses from 1982 to 1986, or equal to about 10% of the book value of industry assets at that time, or about 15% of industry's liabilities.

Alternatively, if the uranium production industry could pass on the Subpart W implementation costs to its electric power industry customers, who would likely pass on the costs to the electricity users, the 1989 economic impact assessment concluded:

> *The revenue earned by the* [electric power] *industry for generating 2.4 trillion kilowatt hours of electricity in 1986 was 121.40 billion dollars. The 1987 present value of the regulation (estimated to be $250 million) is less than 1 percent (.06%) of the U.S. total electric power revenue for the same year.* [EPA 1989, Section 4.5.1]

The 1989 BID drew no conclusions regarding what effects, if any, these impacts would have on the uranium production industry's financial health.

6.2 U_3O_8 Recovery Baseline Economics

This section presents the baseline economics for development of new conventional mills, ISL facilities, and heap leach facilities. EPA's economic assessment guidelines define the baseline economics as "a reference point that reflects the world without the proposed [or in the case of Subpart W, the modified] regulation. It is the starting point for conducting an economic analysis of potential benefits and costs of a proposed [or modified] regulation" (EPA 2010, Section 5).

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the conventional mill, data from the proposed new mill at the Piñon Ridge project in Colorado were used. For the ISL facility, data from two proposed new facilities were used: the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production

period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Sections 6.2.1 through 6.2.4 provide details of how the project-specific cost data were converted into base case economic data, and Section 6.2.5 presents a short sensitivity study for the conventional mill and heap leach cost estimates. Because two projects were analyzed, a sensitivity analysis of the ISL cost estimates was not performed.

Next it was necessary to estimate the annual amount of U_3O_8 that is currently used and how much would be required in the future. For these estimates, data from the Energy Information Administration (EIA) were used. Section 6.2.6 describes how the EIA data were coupled with specific cost data for the uranium recovery facilities to determine the cost and revenue estimates provided in Table 18.

Table 18: Uranium Recovery Baseline Economics (Nondiscounted)

Cost / Revenue	2009 ($1,000)		2035 Projections ($1,000)*			
	2009$	2011$	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$347,000	$462,000	$502,000	$473,000	$605,000	$706,000
U_3O_8 Cost	$298,000	$372,000				
Conventional			$398,000	$375,000	$480,000	$560,000
In-Situ Leach			$396,000	$373,000	$477,000	$557,000
Heap Leach			$356,000	$335,000	$429,000	$501,000
Mixed Facilities			$392,000	$368,000	$472,000	$553,000

* See the discussion below and in Section 6.2.6 for a description of these cases.

Table 18 presents uranium production industry cost and revenue for six cases. The first two cases are based on the actual amount of U_3O_8 produced in the United States in 2009 (the last year for which data are available). The two 2009 cases differ in that the first is based on 2009 dollars, including the weighted-average price of $48.92 per pound for uranium of U.S. origin, while the second was based on assumptions used in this analysis (i.e., 2011 dollars and a U_3O_8 price of $65 per pound). The remaining four cases in Table 26 are all based on the assumptions used in this analysis, but differ in the amount of U_3O_8 assumed to be produced in the United States in 2035. The first through third 2035 cases are for the Reference, Low Nuclear Production, and High Nuclear Production projected 2035 nuclear power usage, as estimated by the EIA (see Section 6.2.6). It should be noted that most of the U_3O_8 used in the United States is from foreign suppliers. The fourth 2035 case (Ref Low Import) increases the percentage of U.S.-origin uranium to 20% for the reference nuclear power usage estimate.

For each of the four 2035 projection cases, four assumptions were made regarding the source of the U_3O_8: (1) all U_3O_8 is from conventional mills, (2) all U_3O_8 is from ISL (recovery) facilities, (3) all U_3O_8 is from heap leach facilities, and (4) the U_3O_8 is from a mixture of uranium recovery facilities (see Section 6.2.6, page 87, for a definition of the mixture). Table 19 shows that the type of uranium recovery facility assumed makes only about a 15% difference between the lowest cost (heap leach) and the largest cost (ISL) recovery type facility.

6.2.1 Conventional Mill Cost Estimate

The base case economic costs for development of a new conventional mill were developed using data from the proposed new mill at Piñon Ridge in Colorado (Edge 2009). Although cost estimates for other conventional mills were reviewed, e.g., Coles Hill (Lyntek 2010), Church Rock (BDC 2011), the Piñon Ridge cost estimate was selected for the base case because it is believed to be the furthest advanced. Specific cost data obtained from the Piñon Ridge project (i.e., Edge 2009, Tables 7.1-1 and 7.1-2) were for land acquisition and facility construction, operating and maintenance, decommissioning, and regulatory oversight. While the Piñon Ridge project supplied the mill design parameters and the overall magnitude of the cost, additional data on the breakdown of the capital and operating costs were taken from the Coles Hill uranium project located in Virginia (Lyntek 2010).

Assumptions used to develop the conventional mill base case cost estimate include:

- As per the Piñon Ridge project, the mill design processing capacity is1,000 tons per day (tpd), and the licensed operating processing rate is 500 tpd.

- The operating duration is 40 years, as per the Piñon Ridge project.

- Because they were more detailed, the Coles Hill cost data (Lyntek 2010) were used to generate a percentage breakdown of the Piñon Ridge cost estimates (Edge 2009). For example, the Piñon Ridge operating cost estimate was divided into labor, power and water, spare parts, office and lab supplies, yellowcake transportation, tailings operating, and general and administration (G&A) using Coles Hill percentages. Thus, the Coles Hill data affected the detailed breakdown of the cost estimate, but not its magnitude.

- Ore grades are 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The base case analysis did not use the Piñon Ridge project's average ore grade of 0.23%.

- The U_3O_8 recovery rate is 96% per the Piñon Ridge project.

- A line of credit (LoC) of $146 million has an annual interest rate of 4%, with a 20-year payback period.

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

The Piñon Ridge project data do not include the costs to develop and/or operate a uranium mine. Rather, it is assumed that these costs are included in the cost of the uranium ore purchased for processing at the Piñon Ridge mill. Mine development and operating costs are included for the conventional mill based on an average of the open pit and underground mine costs developed for the heap leach facility (see Section 6.2.2).

Table 19 presents the cost estimates that were developed for the conventional uranium mill.

Table 19: Conventional Mill Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)	7,000	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	15,958	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$1,037,299	$617,406	$369,925
Line of Credit (LoC)	$146,000	$154,891	$167,155
Mine Costs			
Development	$82,553	$49,136	$29,440
Operating	$261,195	$155,465	$93,148
Mill Costs			
Construction	$134,073	$139,870	$147,761
Mill Direct	$53,136	$55,434	$58,562
Mill Indirect	$9,547	$9,960	$10,522
Mill Contingency	$15,671	$16,348	$17,271
Tailings	$55,718	$58,128	$61,407
Operating and Maintenance	$124,397	$74,042	$44,363
Labor (All inclusive)	$59,267	$35,276	$21,136
Power & Water	$19,400	$11,547	$6,919
Spare Parts	$15,883	$9,454	$5,664
Office and Lab Supplies	$5,117	$3,045	$1,825
Yellowcake Transportation	$2,239	$1,332	$798
Tailings Operating	$22,492	$13,387	$8,021
G&A	$8,634	$5,139	$3,079
Taxes, Claims, and Royalties	$119,289	$71,002	$42,541
Regulatory Oversight	$11,800	$7,191	$4,541
Decommissioning/Closure	$12,000	$3,679	$801
Repay LoC, plus Finance Costs	$214,859	$169,561	$130,302
Total Cost	$968,801	$675,085	$495,978

The cash balance for the conventional mill (as well as the other uranium recovery facilities) is shown in Figure 18. Figure 18 shows that until production year 18, when the LoC has been paid off, the conventional mill is just breaking even.

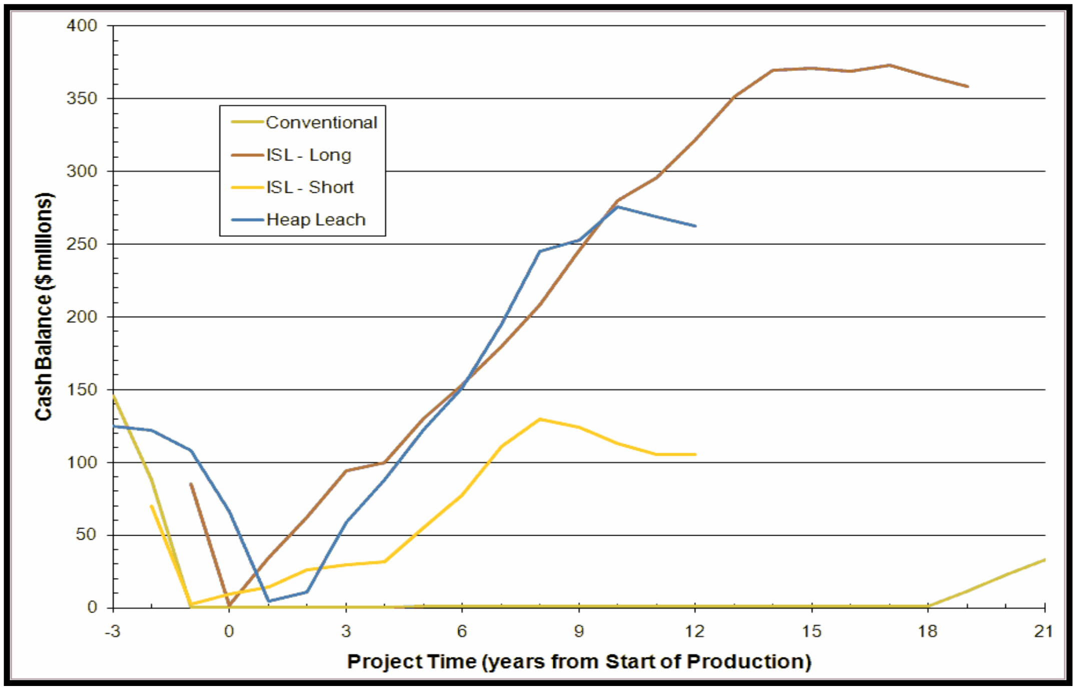


Figure 18: Estimated Cash Balance – Reference Cases

Figure 19 shows the assumed annual U_3O_8 production from the conventional mill (as well as the other uranium recovery facilities). Based on the assumptions used for the base case, the conventional mill produces the least amount of U_3O_8 annually.

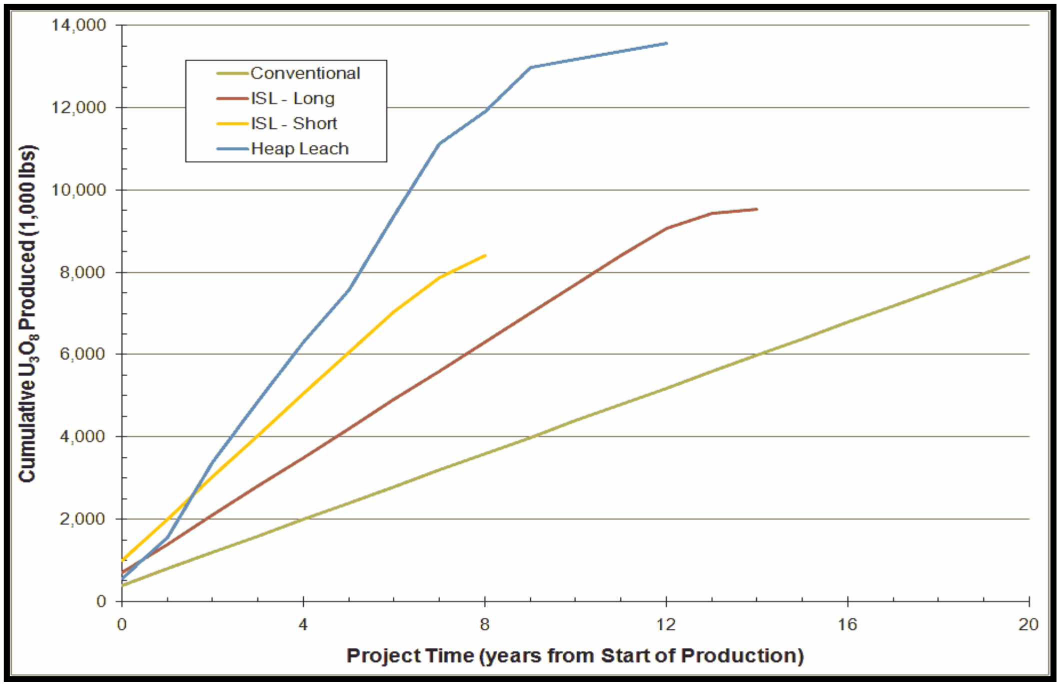


Figure 19: Cumulative U_3O_8 Projections – Reference Cases

6.2.2 Heap Leach Facility Cost Estimate

The base case economic costs for development of a new heap leach facility were developed using data from the proposed new facility at Sheep Mountain in Wyoming (BRS 2011). Specific assumptions used to develop the base case cost estimate for the heap leach facility include:

- The operating duration is 13 years, as per the Sheep Mountain project's uranium production schedule. The annual amount of ore processed averaged 491,758 tons, with maximum and minimum annual processing rates of 916,500 and 74,802 tons, respectively (BRS 2011, page 86).

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the facility capital costs in a manner that would be inconsistent with the estimates provided for the Sheep Mountain project. If additional uranium ore production is to be modeled, a second (or more) and identical heap leach facility should be assumed, either concurrently or sequentially with the first facility.

- Consistent with the Sheep Mountain project cost assumptions, capital investment, totaling $14.177 million, was assumed during the operational period to add more heap leach pads and to replace underground mine equipment. Two additional heap pads were assumed, the first after approximately one-third of the ore is processed, and the second after two-thirds is processed.

- Ore grades were 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The Sheep Mountain project's ore

grades averaged 0.132% for underground and 0.085% for open-pit produced uranium (BRS 2011, page 86).

- The U_3O_8 recovery rate varied between 89% and 92%, depending on the year of operation, as per the Sheep Mountain project (BRS 2011, page 86).

- The cost of open pit mining is $19.28 per ton of ore, while the cost of underground mining is $52.24 per ton, and the cost of heap leach processing is $13.51 per ton (BRS 2011, pages 87 and 88).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $125 million has an annual interest rate of 4%, with a 15-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 20 presents the cost estimates developed for the heap leach facility.

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)			
Open Pit	2,895	N.C.	N.C.
Underground	3,498	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	13,558	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$881,266	$764,878	$643,637
Line of Credit (LoC)	$125,000	$136,591	$153,130
Open Pit Mine			
Capital Costs	$14,590	$14,590	$14,590
Operating Costs	$55,817	$49,594	$42,879
Underground Mine			
Capital Costs	$60,803	$59,880	$58,997
Operating Costs	$182,723	$156,753	$130,078
Heap Pads/Processing Plant			
Capital Costs	$51,885	$50,788	$49,690
Operating Costs	$86,367	$74,973	$63,130

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Shared Costs			
Predevelopment	$10,630	$11,149	$11,874
Reclamation Costs	$17,000	$14,755	$12,416
Taxes, claims, and royalties	$101,346	$87,961	$74,018
Repay LoC/Finance Costs	$168,640	$146,659	$125,441
Total Cost	$749,801	$667,102	$583,114

Figure 18 end of year cash balance for the heap leach facility (as well as for the other uranium recovery facilities). Figure 18 shows that by production year 4, the heap leach facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the heap leach facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the heap leach facility consistently produces the largest quantity of U_3O_8 annually.

6.2.3 In-Situ Leach (Long) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Centennial project in Weld County, Colorado (SRK Consulting 2010b). The Centennial project is expected to have a production period of 14–15 years, which is a long duration for an ISL facility. Annual cost estimates for the Centennial project are provided on pages 117 through 123 of SRK Consulting 2010b. SRK Consulting 2010b, Section 17.11, discusses the basis for the Centennial project cost estimate. Specific assumptions used to develop the ISL (Long) facility base case cost estimate for this analysis include:

- The operating duration is 15 years, as per the Centennial project's uranium production schedule (SRK Consulting 2010b, pages 117 and 120). The facility produces about 700,000 lb of U_3O_8 annually in the first 12 years, then reduces production until only 92,000 lb is produced in the last (15^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Centennial project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Long) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010b, pages 17–24). Funds for restoration are set aside beginning in the second production year and continuing until the end of the project (i.e., year 19 after the start of production).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $85 million has an annual interest rate of 4%, with a 10-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 21 presents the cost estimates that were developed for the ISL (Long) facility.

Table 21: In-Situ Leach (Long) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	9,522	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$618,930	$501,943	$390,820
Line of Credit (LoC)	$85,000	$87,550	$90,950
Operating Cost Summary			
Central Plant/Ponds	$66,536	$52,000	$38,805
Satellite/Well Field	$126,708	$109,218	$90,279
Restoration	$11,257	$8,353	$5,844
Decommissioning	$14,818	$9,175	$5,017
G&A Labor	$16,379	$12,849	$9,732
Corporate Overhead	$6,350	$4,969	$3,761
Contingency	$48,410	$39,313	$30,687
Total Operating Costs	$290,458	$235,877	$184,124
Capital Cost Summary			
CPP/General Facilities	$55,097	$54,027	$52,739
Well Fields	$14,209	$13,868	$13,450
G&A	$13,605	$13,428	$13,212
Mine Closure	$12,585	$7,244	$3,555
Miscellaneous	$14,246	$11,055	$8,202
Contingency	$21,948	$19,924	$18,232
Total Capital Costs	$131,690	$119,546	$109,390
Severance, Royalty, Tax	$71,177	$57,723	$44,944
Repay LoC/Finance Costs	$104,797	$92,076	$78,758
Total Cost	$598,122	$505,223	$417,216

Figure 18 shows the end of year cash balance for the ISL (Long) facility (as well as for the other uranium recovery facilities). Figure 18 shows that by the second year of production, the ISL (Long) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Long) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Long) facility produces an annual

amount of U_3O_8 that is midway between the amounts produced by the conventional mill and heap leach facility.

6.2.4 In-Situ Leach (Short) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Dewey-Burdock project in South Dakota (SRK Consulting 2010a). The Dewey-Burdock project is expected to have a production period of about 9 years, which is representative for an ISL facility. SRK Consulting 2010a, pages 96 through 105, presents annual cost estimates for the Dewey-Burdock project, and Section 17.11 of that report discusses the basis for the Dewey-Burdock project cost estimate. Specific assumptions used to develop the ISL (Short) facility base case cost estimate for this analysis include:

- The operating duration is 9 years, as per the Dewey-Burdock project's uranium production schedule (SRK Consulting 2010a, pages 117 and 120). The facility produces about 1,010,000 lb of U_3O_8 annually in the first 6 years, then production declines until only 533,000 lb is produced in the last (9^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Dewey-Burdock project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Short) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010a, pages 17–18). Funds for restoration are set aside beginning in the first production year and continuing for 2 years after production ends (i.e., production year 11).

- The price for U_3O_8 is \$65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of \$70 million has an annual interest rate of 4%, with a 5-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 22 presents the cost estimates developed for the ISL (Short) facility.

Table 22: In-Situ Leach (Short) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	8,408	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$546,520	$491,065	$431,098
Line of Credit (LoC)	$70,000	$72,100	$74,900
Operating Cost Summary			
Central Plant/Ponds	$31,036	$27,485	$23,754
Satellite/Well Field	$130,056	$116,074	$100,788
Restoration	$6,159	$5,207	$4,234
Decommissioning	$11,614	$8,594	$5,835
G&A Labor	$9,750	$8,637	$7,500
Corporate Overhead	$3,900	$3,450	$2,994
Contingency	$38,503	$33,889	$29,021
Total Operating Costs	$208,558	$186,696	$162,811
Capital Cost Summary			
CPP/General Facilities	$49,338	$50,297	$51,598
Well Fields	$37,127	$36,951	$36,787
G&A	$2,507	$2,463	$2,414
Mine Closure	$22,460	$16,640	$11,314
Miscellaneous	$9,565	$8,253	$6,927
Contingency	$19,707	$19,593	$19,545
Total Capital Costs	$140,705	$134,197	$128,586
Severance, Royalty, Tax	$83,444	$74,899	$65,698
Repay LoC/Finance Costs	$78,619	$74,171	$68,984
Total Cost	$511,326	$469,963	$426,079

Figure 18 shows the end of year cash balance for the ISL (Short) facility (as well as for the other uranium recovery facilities). Figure 18 shows that in its first year of production, the ISL (Short) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Short) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Short) facility produces an annual amount of U_3O_8 that is midway between the amounts produced by the ISL (Long) and heap leach facilities.

6.2.5 Cost Estimate Sensitivities

The uranium recovery facility base case cost estimates developed in Sections 6.2.1 through 6.2.4 were based on the specific assumptions presented in each section. One of the key parameters for the determination of the conventional mill and heap leach facility cost estimates is the assumed ore grade. Table 23 presents the average ore grades reported by the EIA for U.S.-origin uranium during 2009. These are the ore grades assumed for the conventional mill and heap leach facility cost estimates. As noted in Section 6.2.2, the ore grades assumed in the Sheep Mountain project

cost estimate (BRS 2011) were very similar to the Table 23 values. However, as noted in Section 6.2.1, the Piñon Ridge project cost estimate used an ore grade of 0.23%, which is considerably higher than the Table 23 EIA values (Edge 2009).

Table 23: Uranium Ore Grade		
Mine Type	Ore Output (1,000 tons)	Ore Grade
Underground	76,000	0.142%
Open Pit	54,000	0.086%
In-Situ Leach	145,000	0.08%
Total	275,000	0.10%

Source: EIA 2011b

Table 24 summarizes the cost estimates for all four uranium recovery facilities developed in Sections 6.2.1 through 6.2.4. It includes the heap leach facility and conventional mill sensitivity cost estimates based on the alternate ore grade and ore processing assumptions just described.

Table 24: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC[1]	w/o LoC[2]
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87
Conventional as Designed	$26.57	$25.45
Heap Leach w/ High Grade Ore	$22.13	$20.59

1 Total cost minus LoC revenue divided by the pounds of U_3O_8 produced
2 Total cost minus LoC revenue minus finance charge divided by the pounds of U_3O_8 produced.

The Piñon Ridge mill is being designed to process 1,000 tpd of uranium ore but, because of current market conditions, is currently being licensed to process only 500 tpd. The cost estimate in Section 6.2.1 is based on a conventional mill processing 500 tpd. As an alternative, the conventional mill cost estimate is recalculated using an ore grade of 0.23% and an ore processing rate of 1,000 tpd. These results have been included in Table 24.

So that the facilities maintain a positive cash flow, the analyses in Sections 6.2.1 through 6.2.4 assumed that each facility would be provided with an LoC to cover the construction and development costs. The amount of the LoC was determined by how much cash was necessary to maintain a positive cash balance. The interest on the LoC was assumed to be 4%, and the period to repay the LoC varied for each facility, depending on the amount of the LoC. The interest paid on the LoC is included in the facility cost estimates developed in Sections 6.2.1 through 6.2.4.

The right hand column of Table 24 shows what the facility-specific cost estimates would be without an LoC (and if the cash flow was allowed to be negative), or if the interest rate was 0%.

Figure 20 shows the effect of alternative assumptions on the cash balance.

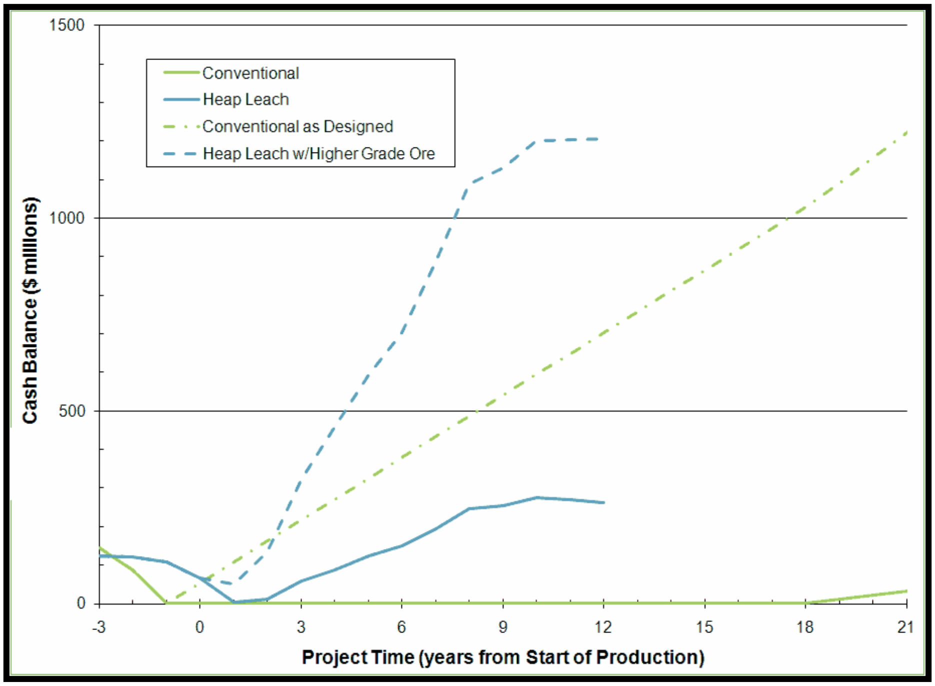


Figure 20: Estimated Cash Balance – Sensitivity Cases

Figure 21 shows the effect of the alternative assumptions on the U_3O_8 production. The obvious conclusion is that the higher the ore grade, the more U_3O_8 is produced, and therefore, the uranium recovery facility is more profitable.

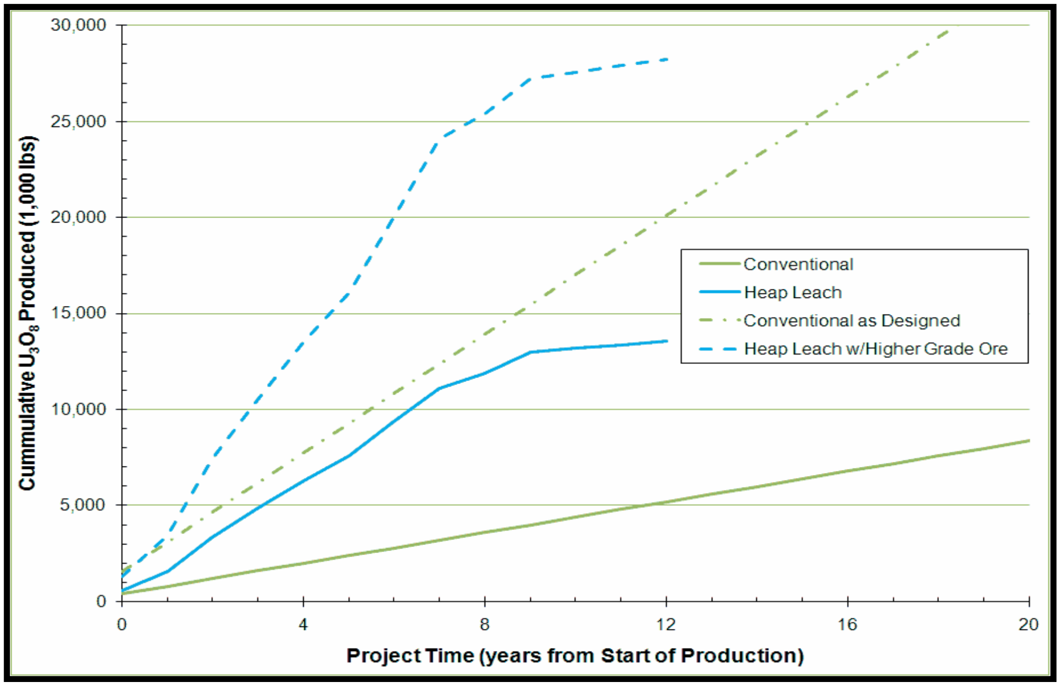


Figure 21: Cumulative U_3O_8 Projections – Sensitivity Cases

6.2.6 Annual Total U_3O_8 Cost Estimates

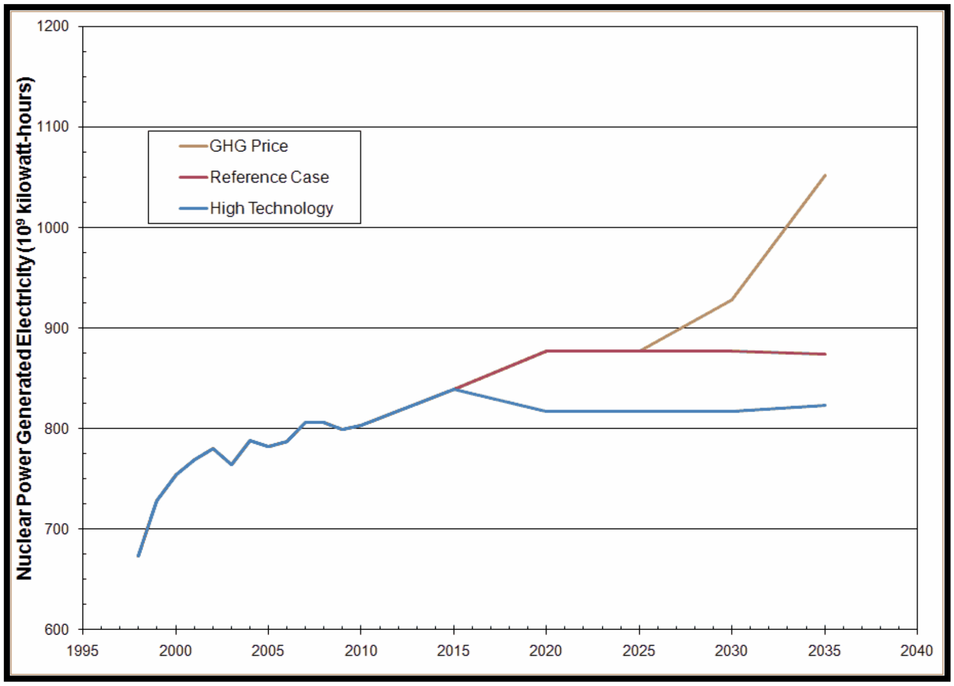
In Sections 6.2.1 through 6.2.4, base case cost estimates were developed for a conventional mill, a heap leach facility, and two ISL facilities. These individual uranium recovery facility cost estimates are used together with the actual 2009 (the last year for which data are available) and projected 2035 U.S.-origin uranium production.

For 2009, the EIA reports that 7,100 thousand pounds of U_3O_8 was produced in the United States (EIA 2011b). For this analysis, the total produced was divided between conventional mills and ISL facilities using the EIA-provided ore outputs, shown in Table 23, which resulted in 3,356,000 lb for conventional mills and 3,744,000 lb for ISL facilities. No heap leach facilities were operating in 2009, so the heap leach production is zero. The 2009 uranium recovery facility total cost and revenue estimates given in Table 18 (page 75) are based on these U_3O_8 production figures and the individual facility unit cost estimates given in Table 24.

These calculated 2009 economic data are based on 2011 dollars (e.g., \$65 per pound of U_3O_8). The 2009 calculated economic data are adjusted to 2009 dollars by assuming an average U_3O_8 price of \$48.92 lb^{-1} (EIA 2010) and adjusting the costs by the ratio of the 2009 energy consumer price index (CPI, 202.301) to the 2011 energy CPI (252.661) (BLS 2011, Table 25). Table 18 (page 75) also gives the 2009 economic data estimates based on 2009 dollars for uranium recovery facilities.

The next part of the analysis was to estimate the future value of the U.S. uranium recovery industry. To this end, it was necessary to estimate the future size of the nuclear power industry. The EIA (2011a) analyzed the U.S. energy outlook for 2011 and beyond, including the contribution from nuclear power. The EIA analyzed a reference case, plus 46 alternative cases,

and determined the nuclear power contribution for each. The EIA reported that in 2010, nuclear power produced 803×10^9 kilowatt-hours of electricity and projected that for the reference case, nuclear power would produce 874×10^9 kilowatt-hours in 2035 (EIA 2011a). Of the 46 alternative cases, the Greenhouse Gas (GHG) Price Economywide and Integrated High Technology cases had the largest and smallest projected nuclear power contributions in 2035, respectively. The GHG Price Economywide case was projected to contribute $1{,}052 \times 10^9$ kilowatt-hours in 2035, while the Integrated High Technology case was projected to contribute 823×10^9 kilowatt-hours. Figure 22 shows and compares the EIA projections.



Source: EIA 2011a

Figure 22: Nuclear-Generated Electricity Projections

It is assumed that the 2035 to 2009 U_3O_8 requirements would have the same ratio as the 2035 to 2010 EIA (2011a) nuclear power estimates. Thus, for the EIA Reference Nuclear, Low Nuclear Production (Integrated High Technology), and High Nuclear Production (GHG Price Economywide) cases, the total U_3O_8 requirements in 2035 are estimated to be 7,728, 7,277, and 9,302 thousand pounds, respectively. Costs were estimated for four cases, with each case assuming a different type of uranium recovery facility responsible for producing the required U_3O_8. The cases are (1) only conventional mills, (2) only ISL facilities, (3) only heap leach facilities, and (4) a mixture of all three types of facilities.

To divide the total U_3O_8 requirement among the three types of uranium recovery facilities for Case 4, it is assumed that one reference heap leach facility would be operational, and that the remainder of the U_3O_8 would be divided between conventional mills and ISL facilities with the same ratio as in 2009. The total amount of U.S.-origin U_3O_8 for each of the 2035 projections is shown in Table 25 for Case 4. For the remaining three cases, the total 2035 projections given in Table 25 were assumed to be produced by the particular mine type associated with the case.

Table 25: Assumed Case 4 U_3O_8 Production Breakdown by Mine Type

Mine Type	U_3O_8 Produced (1,000 lb)				
	2009	2035 Projections			
		Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
Conventional	3,356	3,159	2,947	3,903	4,642
In-Situ Leach	3,744	3,525	3,287	4,355	5,178
Heap Leach	—	1,043	1,043	1,043	1,043
Total	7,100	7,728	7,277	9,302	10,862

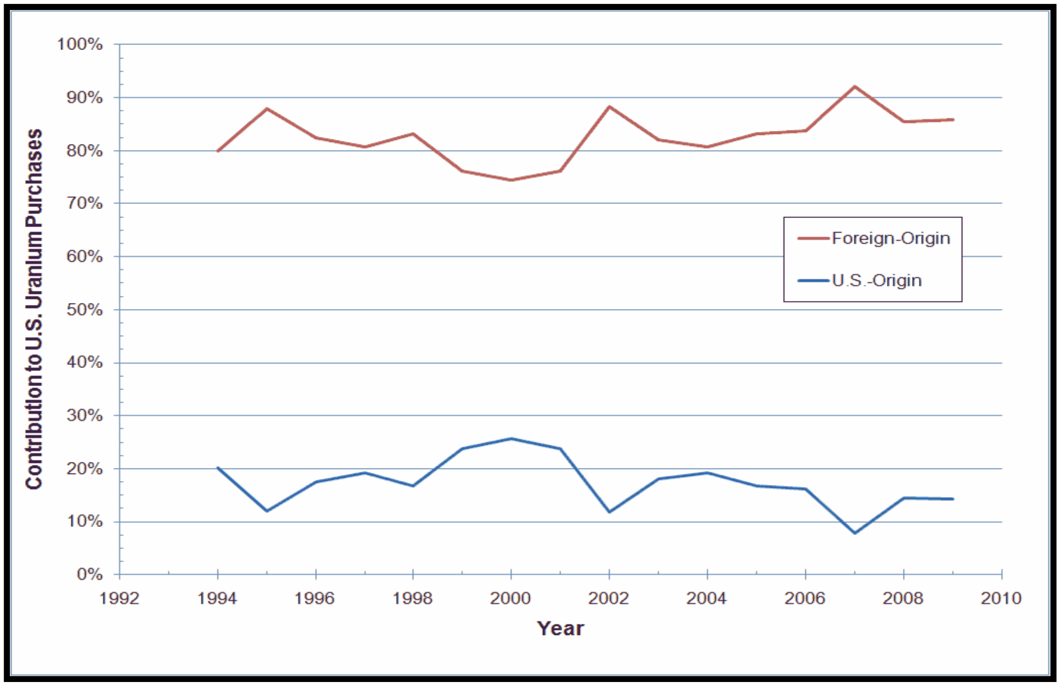
Source: EIA 2011b

The 2035 total cost and revenue estimates for uranium recovery facilities appear in Table 18 (page 75) and are based on the Table 25 U_3O_8 productions and the individual facility unit cost estimates given in Table 24. Refer to Section 6.2 for a discussion of the Table 18 total cost and revenue estimates. Table 26 gives a breakdown by facility type for Case 4, the mixed uranium recovery facility case.

Table 26: Case 4 (Mixed Uranium Recovery Facilities) Economic Projections (Nondiscounted)

Cost/Revenue	2035 Projections ($1,000)			
	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$502,305	$472,994	$604,605	$706,057
Conventional	$205,407	$191,551	$253,767	$301,726
In-Situ Leach	$229,108	$213,653	$283,048	$336,541
Heap Leach	$67,790	$67,790	$67,790	$67,790
U_3O_8 Cost	$391,584	$368,411	$472,461	$552,668
Conventional	$162,932	$151,941	$201,292	$239,334
In-Situ Leach	$180,590	$168,409	$223,108	$265,273
Heap Leach	$48,062	$48,062	$48,062	$48,062

The EIA (2010, Table S1a) shows that most of the U_3O_8 purchased in the United States is of foreign origin (see Figure 23). In 2009, the 7,100 thousand pounds of U_3O_8 produced in the United States amounted to only 14.2% of the total amount of U_3O_8 purchased. Since the total cost and revenue estimates in Table 18 (page 75) are based on the 2009 U.S.-produced U_3O_8, then those estimates include the assumption that 85.8% of the U.S.-purchased U_3O_8 is of foreign origin. As Figure 23 shows, the amount of foreign origin U_3O_8 has fluctuated over time. If all of the U_3O_8 that is purchased in the United States were to be supplied domestically, then the total cost and revenue estimates shown in Table 18 would increase by a factor of 7 (i.e., 1/0.142 = 7). However, this is considered to be unrealistic and is unsupported by the data shown in Figure 23. As an alternative, the Ref Low Import case shown in Table 18 assumes that 20% of the 2035 EIA Reference case U_3O_8 needs would be met domestically.



Source: EIA 2010, Table S1a

Figure 23: U.S. and Foreign Contribution to U_3O_8 Purchases

6.3 Economic Assessment of Proposed GACT Standards

EPA is proposing to revise Subpart W by introducing three categories related to how uranium recovery facilities manage byproduct materials during and after the processing of uranium ore. are presented and described in Section 5.4 presents and describes the proposed GACTs for each category. This section presents the costs and benefits associated with the implementation of the various components of the GACTs. The first category is the standards for conventional mill tailings impoundments. The second category consists of requirements for nonconventional impoundments where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids. Examples of this category are evaporation or holding ponds that exist at conventional mills and ISR and heap leach facilities. Requirements in this second category are that the nonconventional impoundments be provided with a double liner (Section 6.3.2) and that liquid at a depth of 1 meter be maintained in the impoundment (Section 6.3.3). The third category of revised Subpart W would require that heap leach piles be provided with a double liner (Section 6.3.4) and that the pile's moisture content be maintained above 30% by weight (Section 6.3.5). Additionally, the revised Subpart W would remove the requirement to monitor the radon flux at conventional facilities constructed on or prior to December 15, 1989 (Section 6.3.1).

6.3.1 Method 115, Radon Flux Monitoring

Existing Subpart W regulations require licensees to perform annual monitoring using Method 115 to demonstrate that the radon flux at conventional impoundments constructed before December 15, 1989, is below 20 pCi/(m^2-sec). The elimination of this monitoring requirement

would result in cost savings for the three facilities to which this requirement still applies: Sweetwater, White Mesa, and Shootaring Canyon.[9]

Radon Flux Monitoring Unit Costs

Method 115 requires that multiple large-area activated charcoal collectors (LAACCs) be employed to make radon flux measurements. The first step in preparing this cost estimate was to develop the cost for making a single LAACC radon flux measurement. Unit cost data for performing LAACC radon flux measurements were obtained from three primary sources: the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (EPA 2000a), KBC Engineers (KBC 2009), and Waste Control Specialists (WCS 2007). Weston Solutions provided fully loaded billing rates for radiation safety officers (RSOs) and certified health physicists (CHPs) (WS 2003).

MARSSIM (EPA 2000a)—MARSSIM is a multivolume document that presents methodologies for performing radiation surveys. Appendix H to MARSSIM describes field survey and laboratory analysis equipment, including the estimated cost per measurement. Included in Appendix H is the cost estimate for performing an LAACC measurement. The MARSSIM estimated cost range for LAACC radon flux measurements is $20 to $50 per measurement, including the cost of the canister. Since MARSSIM, Revision 1, was published in August 2000, it is assumed that this cost estimate is in 2000 dollars. MARSSIM does not estimate the cost for deploying the canisters or for final report preparation.

KBC Engineers (KBC 2009)—In November 2009, KBC Engineers prepared a revised "Surety Rebaselining Report" for the Kennecott Uranium Company's Sweetwater Uranium Project, which included an estimate for the cost of performing Method 115 radon flux monitoring. KBC based the canister testing cost of $50 per canister on past invoices received from Energy Laboratories, Inc. (a commercial analytical laboratory). In addition to the cost for the laboratory work, KBC included estimates for setting up and retrieving canisters in the field and for data analysis and report preparation. KBC estimated that a technician/engineer with a fully loaded billing rate of $100 per hour would require 40 hours to set up and retrieve 110 canisters, or $36.36 per canister. Also, KBC estimated that an engineer/scientist with a fully loaded billing rate of $105 per hour would require 20 hours for data analysis and report preparation for the 110 canisters, or $19.06 per canister. The KBC unit cost estimates are in 2009 dollars.

Waste Control Specialists (WCS 2007)—In its application to construct and operate a byproduct material disposal facility,[10] Waste Control Specialists, LLC (WCS) included a closure plan and corresponding cost estimate. As part of the final status survey, the radon flux through the disposal unit cap will be measured using LAACCs. WCS used the MARSSIM value as the cost for testing the canister. In addition, WCS included the cost of an RSO at $75 per hour to conduct the survey and prepare report and the cost of a CHP at $104 per hour to review the survey data. For the 100 canisters assumed, WCS assumed the RSO would require 40 hours for a cost of $30

[9] Cotter Corporation has indicated that the primary impoundments at its Cañon City site are no longer active, and thus, it has stopped performing Subpart W radon flux monitoring at that site (Thompson 2010).

[10] The WCS facility is not a conventional tailings facility or a uranium recovery facility. It was specially constructed to handle the K-65 residues that were stored at DOE's Fernald site.

per canister and the CHP would require 10 hours, or $10.40 per canister. The WCS unit costs are in 2004 dollars.

Weston Solutions (WS 2003)—Weston Solutions did not estimate the cost associated with Method 115 radon flux monitoring, but it did include the fully loaded hourly billing rates for radiation supervisors (equivalent to RSOs) and CHPs of $78 and $133, respectively. These billing rates are in 2003 dollars.

Unit Costs—Table 27 summarizes the data provided in the four source documents. The first step was to adjust all of the data to constant 2011 dollars. The CPI (DOL 2012) was used to make this adjustment. The right side of Table 27 shows the adjusted cost data.

Table 27: Data Used to Develop Method 115 Unit Costs

Data as Provided						Adjusted to November 2011 (CPI = 226.23)		
Source	Date	CPI	Cost per Canister			Cost per Canister		
			Testing	Setup/ RSO	Analysis/ CHP	Testing	Setup/ RSO	Analysis/ CHP
EPA 2000a	Aug-00	172.8	$20.00	N.G.	N.G.	$26.18	N.G.	N.G.
			$50.00	N.G.	N.G.	$65.46	N.G.	N.G.
WS 2003	Dec-03	184.3	N.G.	$31.20	$13.30	N.G.	$38.30	$16.33
WCS 2007	May-07	207.949	$25.00	$30.00	$10.40	$27.20	$32.64	$11.31
			$50.00			$54.40		
KBC 2009	Nov-09	216.33	$50.00	$36.36	$19.09	$52.29	$38.03	$19.96

N.G. = not given in the source document

Based on the data from Table 27, minimum, average, and maximum unit costs for performing Method 115 radon flux monitoring were estimated and are shown in Table 28.

Table 28: Method 115 Unit Costs

Type	LAACC Unit Cost ($/Canister)			
	Testing	Setup/RSO	Analysis/CHP	Total
Minimum	$26.18	$32.64	$11.31	$70.14
Average	$45.11	$36.32	$15.87	$97.29
Maximum	$65.46	$38.30	$19.96	$123.72

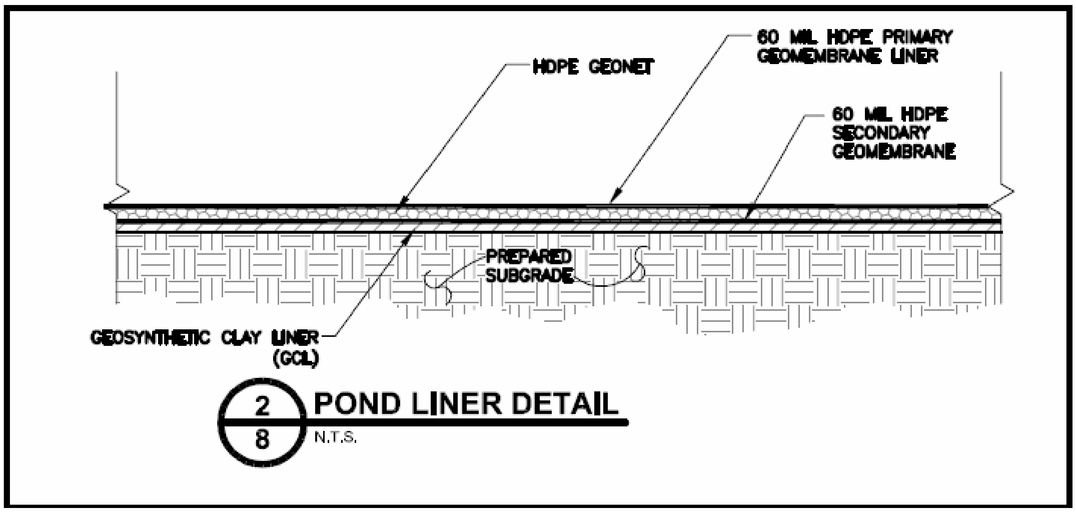
Total Annual Cost Savings (Benefit)

Method 115 requires 100 measurements per year as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. Additionally, if there are exposed beaches or soil-covered areas (as is likely at White Mesa), then an additional 100 measurements are necessary. Thus, for the three sites still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring (based on the Table 28 LAACC unit costs) is estimated to be about $9,730 per site per year for Shootaring and

Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 yr^{-1}, with a range from approximately $28,000 to $49,500 yr^{-1}.

6.3.2 Double Liners for Nonconventional Impoundments

Uranium byproduct materials are often stored in onsite impoundments at uranium recovery facilities, including in holding ponds and evaporation ponds. These ponds can be collectively referred to as nonconventional impoundments, to distinguish them from conventional tailings impoundments. This section provides an estimate of the cost to provide these nonconventional impoundments with a double liner, including a leak collection layer. Figure 24 shows a typical design of an impoundment double liner.



Source: Golder 2008, Drawing 8

Figure 24: Typical Double-Lined Impoundment with Leak Collection Layer

Double Liner Unit Costs

Unit costs, per square foot of liner, have been estimated for the three components of the double liner system: the geomembrane (HDPE) liner, the drainage (Geonet) layer, and the geosynthetic clay liner (GCL).

HDPE Unit Cost—The geomembrane (HDPE) liner installation unit cost estimates shown in Table 29 were obtained from the indicated documents and Internet sites. The Table 29 unit costs include all required labor, materials, and manufacturing quality assurance documentation costs (Cardinal 2000, VDEQ 2000). Where necessary, the unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 29 geomembrane (HDPE) liner mean unit cost is $0.95 ft^{-2}, the median cost is $0.74 ft^{-2}, while the minimum and maximum costs are $0.45 and $2.35, respectively.

Table 29: Geomembrane (HDPE) Liner Unit Costs

Data Source	Unit Cost (ft^{-2})		Thickness - Area
	As Given	2011$	
Foldager 2003	$0.37	$0.45	Not Specified
Vector 2006	$0.45	$0.50	60 mil
Cardinal 2000	$0.39	$0.51	60 mil - 470,800 SF
Cardinal 2000	$0.40	$0.52	60 mil - 138,920 SF
Earth Tech 2002	$0.45	$0.57	60 mil
Cardinal 2000	$0.47	$0.61	60 mil - 118,800 SF
VDEQ 2000	$0.48	$0.63	60 mil
Duffy 2005	$0.60	$0.70	40 mil
Get-a-Quote	$0.70	$0.70	40 mil
Cardinal 2000	$0.54	$0.71	60 mil - 60,600 SF
MWH 2008	$0.70	$0.74	40 mil
Project Navigator 2007	$0.70	$0.76	60 mil
MWH 2008	$0.80	$0.84	80 mil
Get-a-Quote	$0.86	$0.86	60 mil
EPA 2004	$0.80	$0.96	60 mil
Get-a-Quote	$1.04	$1.04	80 mil
Free Construction	$1.05	$1.05	40 mil
Free Construction	$1.69	$1.69	60 mil
Foldager 2003	$1.40	$1.72	Not Specified
Free Construction	$2.00	$2.00	80 mil
Lyntek 2011	$2.35	$2.35	80 mil

Drainage Layer (Geonet) Unit Cost—Some of the documents reviewed included unit cost estimates for installation of the drainage (Geonet) layer, as shown in Table 30. As with the geomembrane (HDPE) liner unit costs, the drainage (Geonet) layer unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 30 drainage layer (Geonet) mean unit cost is \$0.64 ft^{-2}, the median cost is \$0.57 ft^{-2}, while the minimum and maximum costs are \$0.48 and \$1.02, respectively.

Table 30: Drainage Layer (Geonet) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
EPA 2004	$0.40	$0.48
Project Navigator 2007	$0.45	$0.49
Earth Tech 2002	$0.45	$0.57
MWH 2008	$0.60	$0.63
Duffy 2005	$0.88	$1.02

Geosynthetic Clay Liner (GCL) Unit Cost—Some of the documents reviewed also included unit cost estimates for installation of the GCL, as shown in Table 31. As for the geomembrane (HDPE) liner unit costs, the CPI was used to adjust the GCL unit costs from the year they were estimated to year 2011 dollars. The Table 31 GCL mean unit cost is \$0.69 ft^{-2}; the median cost is \$0.65 ft^{-2}; and the minimum and maximum costs are \$0.45 and \$1.12, respectively.

Table 31: Geosynthetic Clay Liner (GCL) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
Vector 2006	$0.40	$0.45
EPA 2004	$0.40	$0.48
Earth Tech 2002	$0.52	$0.65
Project Navigator 2007	$0.70	$0.76
Lyntex 2011	$1.12	$1.12

Some designs may choose to use a compacted clay layer beneath the double liner (e.g., Figure 26). However, Sandia (1998) has found that "[r]eplacing the 60 cm thick clay (amended soil) barrier layer with a GCL drastically reduced the cost and difficulty of construction." This savings was due to avoiding the expense of obtaining the bentonite clay and the difficulties of the clay being "sticky to spread and slippery to drive on," plus "compaction was extremely difficult to achieve." For these reasons, it is believed that GCL will be used in most future applications and is thus appropriate for this cost estimate.

Design and Engineering—The cost estimates include a 20% allowance for design and engineering for the mean and median estimates, and a 10% and 20% allowance for the minimum and maximum estimates, respectively. The design and engineering cost has been calculated by multiplying the capital and installation cost by the allowance factor.

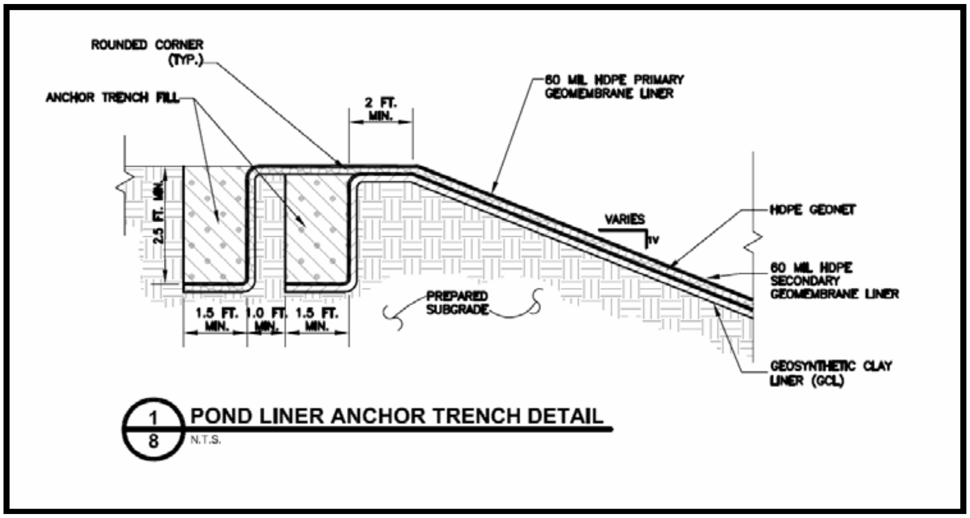
Contractor Oversight—The cost estimates include a 20% allowance for contractor oversight for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The contractor oversight cost has been calculated by multiplying the capital and installation cost by the allowance factor.

Overhead and Profit—The cost estimates include a 20% allowance for overhead and profit for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The overhead cost and profit has been calculated by multiplying the sum of the capital and installation, design and engineering, and contractor oversight costs by the allowance factor.

Contingency—The cost estimates include a contingency factor of 20% for the mean and median estimates, and 15% and 25% for the minimum and maximum estimates, respectively. The contingency has been calculated by multiplying the sum of all of the other costs by the contingency factor.

Double Liner Capital and Installation Cost

Impoundment Areas—Figure 25 shows that in order to anchor the upper liner and drainage layer (Geonet), an additional 8.5 ft of material is required on each side of the impoundment. Similarly, an additional 6 ft of material is required on each side of the impoundment to anchor the lower liner and the GCL.



Source: Golder 2008, Drawing 8

Figure 25: Typical Double Liner Anchor System

Section 6.2 describes base facilities for each type of uranium recovery facility: conventional, ISR, and heap leach. Since they are not given in Section 6.2, Table 32 shows the impoundment surface areas for each of the base facilities, plus the areas of the upper liner, drainage layer (Geonet), lower liner, and GCL. The liner areas include additional material in order to anchor the liner, plus an additional 10% to account for the sloping of the sides and waste.

Table 32: Nonconventional Impoundment Areas

Facility Type	Impoundment Type	Number	Area (acres)		
			Surface	Upper Liner & Geonet	Lower Liner & GCL
Conventional (Golder 2008)	Evaporation	10	4.13	4.94	4.82
	Total	10	41.30	49.39	48.22
ISR (Powertech 2009)	Water Storage	10	7.20	8.41	8.26
	Process Water	1	3.31	3.98	3.88
	Total	11	75.31	88.05	86.50
Heap (Titan 2011)	Raffinate	1	0.9	1.17	1.11
	Collection	1	1.5	1.88	1.81
	Evaporation	1	5.7	6.71	6.58
	Total	3	8.10	9.75	9.50

Impoundment Double Liner Cost—Based on the above estimated quantities of material and unit costs, Table 33 presents the median, minimum, and maximum capital costs for installing the

double liner beneath the impoundments of each of the three types of uranium recovery facilities: conventional, ISR, and heap leach.

Table 33: Base Facility Nonconventional Impoundment Double Liner Capital and Installation Costs

Cost Type	Conventional	ISR	Heap
Mean	$13,800,000	$24,700,000	$2,700,000
Median	$11,500,000	$20,600,000	$2,300,000
Minimum	$6,500,000	$11,600,000	$1,300,000
Maximum	$32,900,000	$58,900,000	$6,500,000
Mean, w/o Upper Liner	$6,800,000	$12,100,000	$1,300,000

To demonstrate the individual component contribution to the total capital and installation cost, Table 34 presents the calculated mean capital cost breakdown by category.

Table 34: Mean Base Facility Nonconventional Impoundment Double Liner Capital and Installation Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Impoundment Double Liner Capital and Installation Cost		
		Conventional	ISR	Heap
Upper Liner	$0.95	$2,040,654	$3,638,014	$402,799
Drainage (Geonet)	$0.64	$1,370,814	$2,443,844	$270,581
Lower Liner	$0.95	$1,992,191	$3,573,958	$392,414
GCL	$0.69	$1,455,818	$2,611,714	$286,761
Design & Engineering	20%	$1,371,895	$2,453,506	$270,511
Contractor Oversight	20%	$1,371,895	$2,453,506	$270,511
Overhead & Profit	20%	$1,920,654	$3,434,908	$378,715
Contingency	20%	$2,304,784	$4,121,890	$454,459
Total	—	$13,828,706	$24,731,338	$2,726,751

Table 33 includes capital and annual cost estimates for a mean, without upper liner case. This case was added because, even if not required to comply with 40 CFR 192.32(a)(1), the design of nonconventional impoundments at uranium recovery facilities would include at least a single liner. The reason is that the NRC, in 10 CFR 40, Appendix A, Criterion 5(A), requires that "… surface impoundments (…) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water … ." Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

Double Liner Total Annual Cost

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb.

Table 35 presents the calculated annualized cost for installation of a double liner in a nonconventional impoundment for the 2035 projected U_3O_8 productions. The annualized cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of each uranium recovery facility, and then multiplying by the projected amount of U_3O_8 produced annually. Table 35 presents four cases. In the first three cases, it was assumed that a single type of uranium recovery facility would produce all of the U_3O_8 required in 2035, while in the fourth case, it was assumed that a mixture of uranium recovery facilities would be operating in 2035. For the fourth case, Table 25 gives the contribution to the total U_3O_8 required in 2035 by each type of facility.

Table 35: Projected Nonconventional Impoundment Double Liner Annualized Capital and Installation Costs

Cost Type	Projected 2035 U_3O_8 Production	Annualized Capital and Installation Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$6,700,000	$22,700,000	$1,600,000	$14,800,000
Median	Reference Nuclear	$5,600,000	$18,900,000	$1,400,000	$12,400,000
Minimum	Low Nuclear Production	$2,900,000	$10,000,000	$700,000	$6,500,000
Maximum	Reference Low Import	$22,400,000	$76,100,000	$5,500,000	$49,300,000
Mean, w/o Upper Liner	Reference Nuclear	$3,300,000	$11,100,000	$800,000	$7,300,000

In addition to the annualized capital and installation costs, the total annual cost includes the costs associated with the operation and maintenance (O&M) of the double liner. For the double liner, O&M would consist of daily inspection of the liner and repair of the liner when rips or tears are observed above the water level or when water is detected in the leak detection layer. Since daily inspections of the nonconventional impoundments are part of the routine operation of the uranium recovery facility (Visus 2009), the only additional O&M cost associated with the double liner would be the repair costs. It was assumed that the annual O&M cost for the nonconventional impoundments would be 0.5% of the total capital cost for installing the liners (MWH 2008 and Poulson 2010). Using the Table 33 base facility cost estimates for installation of the double liner, Table 36 shows the calculated double liner O&M costs for each base facility.

Table 36: Base Facility Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	O&M Allowance	Base Facility Annual O&M Cost ($/yr)		
		Conventional	ISR	Heap
Mean	0.5%	$68,000	$120,000	$13,000
Median	0.5%	$56,000	$100,000	$11,000
Minimum	0.25%	$16,000	$29,000	$3,200
Maximum	1.0%	$330,000	$590,000	$65,000
Mean, w/o Upper Liner	0.5%	$34,000	$61,000	$6,700

Table 37 shows annual O&M costs for the projected 2035 U_3O_8 productions. The Table 37 annual O&M costs were calculated by dividing the Table 36 costs by each base facility's annual U_3O_8 production and then multiplying by the projected 2035 U_3O_8 production.

Table 37: Projected Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	Projected 2035 U_3O_8 Production	Annual Operation and Maintenance Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$1,300,000	$990,000	$50,000	$1,100,000
Median	Reference Nuclear	$1,100,000	$830,000	$39,000	$950,000
Minimum	Low Nuclear Production	$300,000	$230,000	$11,000	$250,000
Maximum	Reference Low Import	$9,000,000	$6,900,000	$330,000	$7,600,000
Mean, w/o Upper Liner	Reference Nuclear	$700,000	$500,000	$24,000	$560,000

The total annual cost for a double liner in a nonconventional impoundment is simply the sum of the annualized capital (Table 35) and installation cost plus the annual O&M cost (Table 37). Table 38 shows these total annual costs for the five cost types and four assumed uranium recovery facility cases.

Table 38: Projected Nonconventional Impoundment Double Liner Total Annual Costs

Cost Type	Projected 2035 U_3O_8 Production	Total Annual Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$8,000,000	$23,700,000	$1,700,000	$16,000,000
Median	Reference Nuclear	$6,700,000	$19,800,000	$1,400,000	$13,300,000
Minimum	Low Nuclear Production	$3,200,000	$10,200,000	$700,000	$6,800,000
Maximum	Reference Low Import	$31,400,000	$83,000,000	$5,800,000	$56,900,000
Mean, w/o Upper Liner	Reference Nuclear	$3,900,000	$11,700,000	$800,000	$7,800,000

Section 6.2, Table 18 (page 75), shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection. Table 39 compares those total U_3O_8 production costs to the double liner total costs given in Table 38. As Table 39 shows, the cost to install a double liner is less than 6% of the total cost to produce U_3O_8, while the cost to upgrade from a single liner to a double liner is less than 3% of the total cost.

Table 39: Comparison of Double Liner to Total U_3O_8 Production Costs

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)			Liner Contribution	
	Total Annual (Table 18)	Double Liner (Table 38)	Single to Double (Table 38)	Double Liner	Single to Double
Conventional	$398	$8.0	$3.9	2.0%	1.0%
In-Situ Leach	$411	$23.7	$11.7	5.8%	2.8%
Heap Leach	$356	$1.7	$0.8	0.5%	0.2%
Mixed Facilities	$396	$16.0	$7.8	4.0%	2.0%

Finally, the conventional, ISR, and heap leach base uranium recovery facilities (see Section 6.2) include a double liner, with drainage layer (Geonet) collection system for their onsite

impoundment designs. Thus, there is no additional cost for the Section 6.2 base uranium recovery facilities to meet the design and construction requirements at 40 CFR 192.32(a)(1) for onsite nonconventional impoundments.

Benefits from a Double Liner for a Nonconventional Impoundment

Including a double liner in the design of all onsite nonconventional impoundments that would contain uranium byproduct material would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, decision makers should consider this benefit because of the significance of ground water as a source of drinking water.

6.3.3 Maintaining 1 Meter of Water in Nonconventional Impoundments

As shown in Section 3.3.1, as long as a depth of approximately 1 meter of water is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine if there is any contribution above background radon values. This section estimates the cost to maintain 1 meter of water in the impoundment.

In order to maintain 1 meter, or any level, of water within a pond it is necessary to replace the water that is evaporated from the pond. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with makeup water supplied by the pond's operator. The replacement process is assumed to be required as part of the normal operation of the uranium recovery facility, which would occur regardless of the GACT. Thus, this cost estimate does not include process water replacement.

Unit Cost of Water

Three potential sources of pond makeup water were considered: municipal water suppliers, offsite non-drinking-water suppliers, and onsite water.

Municipal Water Supplier (Black & Veatch 2010)—In 2009/2010, a survey of the cost of water in the 50 largest U.S. cities was performed (Black & Veatch 2010). The survey compiled typical monthly bill data for three residential (3,750, 7,500, and 15,000 gallon/month), a commercial (100,000 gallon/month), and an industrial (10,000,000 gallon/month) water users. For this study, the commercial and industrial data were normalized to dollars per gallon, and the higher of the two values was used.

The survey found that the cost of water ranged from \$0.0012 $gallon^{-1}$ in Sacramento, California, to \$0.0066 $gallon^{-1}$ in Atlanta, Georgia, with a mean of \$0.0031 $gallon^{-1}$ and a median of \$0.0030 $gallon^{-1}$. Looking at only those cities located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, and Texas; the survey included no cities in Utah or Wyoming), the survey found that the cost of water ranged from \$0.0016 $gallon^{-1}$ in Albuquerque, New Mexico, to \$0.0045 $gallon^{-1}$ in Austin, Texas, with a mean and median of \$0.0031 $gallon^{-1}$.

Offsite Non-Drinking-Water Suppliers (DOA 2004)—The water supplied by municipal water suppliers has been treated and is suitable for human consumption. It is not necessary for

impoundment evaporation makeup water to be drinking water grade. Therefore, using the data from the 50-city survey would likely overestimate the impoundment makeup water cost. Unfortunately, no data could be found as to the cost of non-drinking-water grade water for use as impoundment makeup water. However, another large scale use of non-drinking-water grade water is for crop irrigation, and the U.S. Department of Agriculture has compiled data on the cost of irrigation water for crops (DOA 2004).

For offsite sources of irrigation water, the Department of Agriculture states that the "31.6 million acre-feet of water received from off-farm water suppliers … cost irrigators $579 million, for an average cost of $18.29 per acre-foot of water …" (DOA 2004, page XXI), or $0.000056 gallon^{-1}.

Onsite Water (DOA 2004)—The Department of Agriculture identifies both wells (43.5 million acre-feet) and surface water (11.8 million acre-feet) as sources of onsite water. The cost for both sources is essentially the cost to pump the water from its source to where it is used. Unfortunately, the Department does not provide separate pumping costs for each onsite source, but instead states:

> *There were 497,443 irrigation pumps of all kinds used on 153,117 farms in 2003 irrigating 42.9 million acres of land. These pumps were powered by fuels and electricity costing irrigators a total of $1.55 billion or an average of $10,135 per farm. The principal energy source used was electricity, for which $953 million was spent to power 319,102 pumps that irrigated 24.1 million acres at an average cost of $39.50 per acre. Solar energy was reported as the source for pumping wells on 360 farms irrigating 16,430 acres.* [DOA 2004, page XXI]

From these data, it is possible to determine that the mean cost for pumping onsite water from both sources is $0.000086 gallon^{-1}. Also, on a per acre basis, the cost of using electricity to pump the water is slightly higher than the total average cost (i.e., $39.50 versus $36.13), and the use of solar energy to pump water is very rare (i.e., only about 0.03%).

Unit Costs—Table 40 shows the makeup water unit costs that have been estimated for this study. As described, the municipal water source costs are taken from Black & Veatch 2010, while the mean costs for offsite non-drinking and onsite water sources were taken from DOA 2004. All unit water costs were adjusted to 2011 dollars.

Although the Department of Agriculture did not present sufficient data to allow for the calculation of minimum, maximum, and median unit water costs, these costs were estimated by assuming that the cost of offsite non-drinking and onsite water sources have variation in costs similar to the variation in municipal supplier costs. Table 40 also shows these estimated makeup water unit costs.

Table 40: Makeup Water Unit Costs

Area	Source	Makeup Water Unit Costs ($gallon^{-1}$)			
		Minimum	Mean	Median	Maximum
United States	Municipal Supplier	$0.0013	$0.0033	$0.0032	$0.0069
	Offsite Non-Drinking	$0.000027	$0.000069	$0.000067	$0.000144
	Onsite Source	$0.000041	$0.00011	$0.00010	$0.00022
Potential Uranium Producing States (AZ, CO, NM, TX)	Municipal Supplier	$0.0017	$0.0032	$0.0033	$0.0047
	Offsite Non-Drinking	$0.000035	$0.000068	$0.000068	$0.000099
	Onsite Source	$0.000054	$0.00010	$0.00010	$0.00015

Additionally, Edge (2009) presents the discounted cost of estimated consumptive water use for the Piñon Ridge conventional mill. With 3% and 7% discount rates, the 40-year cost of water was presented as $58,545 and $33,766, respectively, which translates into an annual cost of $2,533. Edge (2009, page 7-2) indicates that the Piñon Ridge mill is estimated to use 227 acre-feet of water per year. This gives a water unit cost of $0.000034, which is consistent with the Table 40 offsite non-drinking and onsite water sources unit costs.

Total Annual Cost to Maintain 1 Meter of Water

Required Water Makeup Rate (Net Evaporation Rate)—As stated above, in order to maintain the water level within a nonconventional impoundment, it is necessary to replace the water that is evaporated from the impoundment. Some (and in some places all) of the evaporated water will be made up by naturally occurring precipitation. Figure 17 shows the annual evaporation (inches per year (in/yr)) of the lower 48 states, while Figure 16 shows the annual precipitation (in/yr). To determine the annual required water makeup rate, the Figure 16 data is simply subtracted from the Figure 17 data. A positive result indicates that evaporation is greater than precipitation, and makeup water must be supplied, whereas a negative result indicates that precipitation is sufficient to maintain the impoundment's water level.

The U.S. Army Corps of Engineers (ACE) has published net lake evaporation rates for 152 sites located in the United States (ACE 1979, Exhibit I). The ACE found that the net evaporation ranged from -35.6 in/yr in North Head, Washington, to 96.5 in/yr in Yuma, Arizona, with a mean of 10.8 in/yr and a median of 0.9 in/yr. At 82 sites, the evaporation rate exceeds the precipitation rate, and makeup water would be required to maintain the impoundment's water level.

Looking at only those 22 sites located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, Texas, Utah, and Wyoming), the ACE found that the net evaporation rate ranged from 6.1 in/yr in Houston, Texas, to 96.5 in/yr in Yuma, Arizona, with a mean of 45.7 in/yr and a median of 41.3 in/yr. The evaporation rate exceeded the precipitation rate at all 22 sites in the potentially uranium-producing states included in the ACE study.

Uranium Recovery Facility Pond Size—As described in Section 6.2, a base facility was assumed for each of the three types of uranium recovery facilities. Table 41 gives information for each base facility that is necessary to calculate the annual makeup water cost (i.e., the surface area of the onsite impoundments and the annul U_3O_8 production).

Table 41: Summary of Base Facility Characteristics

Parameter		Conventional	ISR	Heap
Impoundment Surface Area	(acres)	41.3	75.3	8.1
U_3O_8 Production	(lb/yr)	400,000	930,000	2,200,000

Total Annual Cost—The only cost associated with maintaining the water level within the impoundment is the cost of the water. It is assumed that existing piping will connect the nonconventional impoundment to the water source, and that the water level will be visually checked at least once per day (Visus 2009).

The makeup water unit cost data from Table 40, the net evaporation rates from above (page 102), and the impoundment areas from Table 41 are combined to calculate annual makeup water cost estimates provided in Table 42.

Table 42: Base Facility Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)		
			Conventional	ISR	Heap
Mean	$0.00010	45.7	$5,313	$9,687	$1,042
Median	$0.00010	41.3	$4,840	$8,826	$949
Minimum	$0.000035	6.1	$240	$438	$47
Maximum	$0.00015	96.5	$16,337	$29,790	$3,204

The annual cost of makeup water from Table 42 was divided by the base facility U_3O_8 annual production rate from Table 41 to calculate the makeup water cost per pound of U_3O_8 produced, shown in Table 43.

Table 43: Base Facility Makeup Water Cost per Pound of U_3O_8

Cost Type	Makeup Water Cost ($/lb)		
	Conventional	ISR	Heap
Mean	$0.0133	$0.0104	$0.00047
Median	$0.0121	$0.0095	$0.00043
Minimum	$0.00060	$0.00047	$0.000021
Maximum	$0.041	$0.032	$0.0015

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb. Table 44 shows the makeup water costs which were calculated for the U_3O_8 production projected for 2035. The first three cost estimates assume that a single type of uranium recovery facility would be responsible for producing all of the projected U_3O_8, while the last estimates assume that a mix of uranium recovery type facilities is used, as described in Section 6.2.6.

Table 44: Projected Annual Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$102,630	$80,489	$3,660	$88,979
Median	Reference Nuclear	$93,500	$73,329	$3,334	$81,063
Minimum	Low Nuclear Production	$4,366	$3,424	$156	$3,780
Maximum	Reference Low Import	$443,678	$347,963	$15,821	$381,053

Table 18 (page 75) shows the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projections. Table 45 compares those total U_3O_8 production costs to the costs for maintaining 1 meter of water in the impoundments given in Table 44. As Table 45 shows, the cost to maintain 1 meter of water in the impoundments is much less than 1% of the total cost to produce U_3O_8 for all four cases analyzed.

Table 45: Comparison of Cost to Maintain 1 Meter of Water in the Impoundments to Total U_3O_8 Production Cost

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)		1 Meter Water Contribution
	Total Annual (Table 18)	1 Meter Water (Table 44)	
Conventional	$398	$0.103	0.026%
In-Situ Leach	$411	$0.080	0.019%
Heap Leach	$356	$0.004	0.001%
Mixed Facilities	$396	$0.089	0.022%

Total Annual Benefits from Maintaining 1 Meter of Water

By requiring a minimum of 1 meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)} \qquad (6\text{-}1)$$

Where:
- A = Radon attenuation factor (unitless)
- λ = Radon-222 decay constant (sec^{-1})
  = 2.1×10^{-6} sec^{-1}
- D = Radon diffusion coefficient (cm^2/sec)
  = 0.003 cm^2/sec in water
- d = Depth of water (cm)
  = 100 cm

Solving the above equation shows that 1 meter of water has a radon attenuation factor of about 0.07. To demonstrate the impact that a 1-meter water cover would have, the doses and risks reported in Section 4.4, Table 13 (page 49), have been recalculated. In this recalculation, it was assumed that an additional 1 meter of water covered all of the radon sources. Table 46 shows the results of this recalculation, in terms of the dose and risk reduction attributable to covering the

source area with 1 meter of water. Table 46 shows both the original radon release (as reported in Table 13, page 49) and the radon release after the source area has been covered with 1 meter of water.

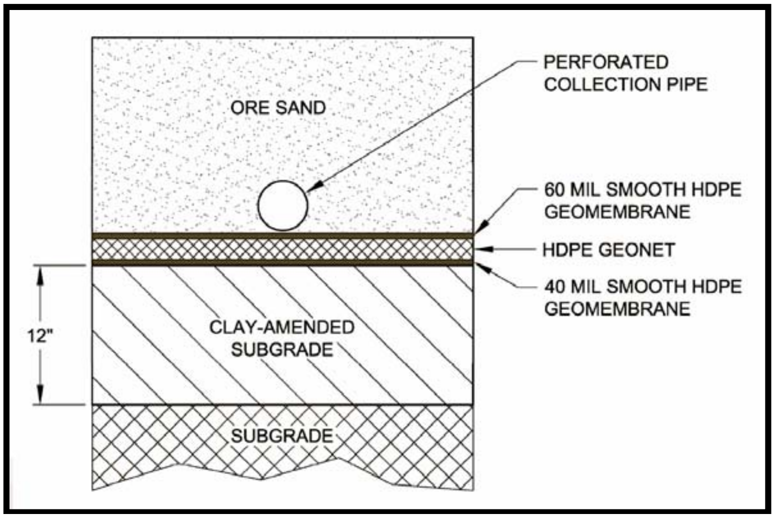
Table 46: Annual Dose and Risk Reduction from Maintaining 1 Meter of Water in the Impoundments

Uranium Site	Radon Release (Ci/yr)		Annual Dose Reduction		LCF(a) Risk Reduction (yr^{-1})	
	Table 13	1 Meter Water	Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	147	0.5	1.1	2.7E-06	5.6E-07
White Mesa	1,750	124	4.8	11.1	3.2E-05	5.9E-06
Smith Ranch - Highlands	36,500	2,590	3.4	1.4	2.1E-05	7.2E-07
Crow Butte	8,885	630	2.5	3.1	1.6E-05	1.6E-06
Christensen/Irigaray	1,600	114	3.5	1.8	2.2E-05	9.2E-07
Alta Mesa	740	52	20.1	10.7	1.2E-04	5.7E-06
Kingsville Dome	6,958	494	53.9	10.5	3.5E-04	5.7E-06

* LCF = latent cancer fatalities

6.3.4 Liners for Heap Leach Piles

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap piles. Figure 26 shows a typical design of a heap leach pile double liner. Although Figure 26 shows a clay-amended layer beneath the double liner, for the reasons given in Section 6.3.2, this cost estimate has assumed that a GCL would be used beneath the double liner, as shown in Figure 24.



Source: Titan 2011

Figure 26: Typical Heap Pile Liner

Double Liner Unit Costs

The unit costs for installing a double liner, with a leakage collection system, to a heap leach pile are assumed to be the same as the units costs developed in Section 6.3.2 for nonconventional impoundments.

The base heap leach facility utilizes a conveyor to deliver crushed material to the pile (Titan 2011). However, if material is delivered to the pile by truck, then the truck would put additional stress on the liner. Additional costs would be incurred to protect the liner from the additional stress. Because this analysis uses a range of liner unit costs, the additional costs for protecting the liner if truck loading is employed have been enveloped.

Total Cost of Heap Leach Pile Double Liner

Section 6.2.2 base heap leach facility (i.e., Sheep Mountain in Wyoming) includes two 80-acre heap piles. Using the same method described for the nonconventional impoundment (page 96), it was estimated that 90.3 acres of material would be required for the upper liner and drainage (Geonet) layer, and 89.6 acres of material for the lower liner and GCL. With these quantities of material and the unit costs from Section 6.3.2, Table 47 presents the median, minimum, and maximum capital and installation costs for installing the double liner beneath the two 80-acre heap piles.

Table 47: Heap Pile Double Liner Capital and Installation Costs

Cost Type	Capital and Installation Cost
Mean	$25,200,000
Median	$20,600,000
Minimum	$11,900,000
Maximum	$60,700,000
Mean, w/o Upper Liner	$12,900,000

Table 47 includes capital and annual cost estimates for a Mean, w/o Upper Liner case. This case was added because even if not required to meet the requirements at 40 CFR 192.32(a)(1), the design of the heap leach pile would include at least a single liner to collect the lixiviant flowing out of the heap. The reason is that since the lixiviant flowing out of the heap contains the uranium, it is in the licensee's economic interest to recover as much of it as possible, and since the rinsing liquid would be mixed with the lixiviant, it too would be recovered. Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

To demonstrate the individual component contribution to the total capital and installation cost, Table 48 presents a breakdown by component of the calculated mean capital and installation cost.

Table 48: Mean Heap Pile Double Liner Capital Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Heap Pile Double Liner Capital Cost
Upper Liner	$0.95	$3,730,077
Drainage (Geonet)	$0.64	$2,505,687
Lower Liner	$0.95	$3,702,230
GCL	$0.66	$2,579,315
Design & Engineering	20%	$2,503,462
Contractor Oversight	20%	$2,503,462
Overhead & Profit	20%	$3,504,847
Contingency	20%	$4,205,816
Total	—	$25,234,896

Table 49 presents the heap pile double liner annual cost estimates. The total annual cost is the sum of the annualized capital and installation cost and the annual O&M cost. The annualized capital cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of the heap leach facility, and then multiplying by the amount of U_3O_8 produced annually. The U_3O_8 annual production was based on 2035 projections made in Section 6.2.6.

Table 49 presents two cases. In the first case, it was assumed that all of the U_3O_8 required in 2035 would be produced by heap leach facilities, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 49: Heap Pile Double Liner Annual Costs

Case	Cost Type	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost
Heap Only	Mean	$15,100,000	$220,000	$15,300,000
	Median	$12,300,000	$180,000	$12,500,000
	Minimum	$6,700,000	$60,000	$6,800,000
	Maximum	$51,100,000	$1,340,000	$52,400,000
	Mean, w/o Upper Liner	$7,700,000	$110,000	$7,800,000
Mix	Mean	$340,000	$5,000	$350,000
	Median	$280,000	$4,000	$280,000
	Minimum	$160,000	$1,000	$160,000
	Maximum	$1,600,000	$43,000	$1,600,000
	Mean, w/o Upper Liner	$170,000	$3,000	$170,000

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for installing a double liner under the heap leach pile is about 4% of the total cost of heap leach U_3O_8 production (i.e., $15.3 million/$356 million), while the cost to change from a single liner to a double liner is about 2% of the total cost of heap leach U_3O_8 production (i.e., $7.8 million/$356 million).

Finally, the Section 6.2.2 base heap leach facility design includes a double liner, with drainage layer (Geonet) collection system, as shown in Figure 26. Thus, there is no additional cost for the Section 6.2.2 base heap leach facility to meet the design and construction requirements at 40 CFR 192.32(a)(1).

Benefits from a Double-Lined Heap Leach Pile

Including a double liner in the design of all heap leach piles would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, it is important for decision makers to consider this benefit because of the significance of ground water as a source of drinking water.

6.3.5 Maintaining Heap Leach Piles at 30% Moisture

As described in Section 5.4, the goal of this GACT is to maintain 30% moisture content in the heap leach pile so that the radon flux will be no larger than the flux from dry ore.

Simply adding water to the surface of the heap leach pile will replenish and maintain the moisture content in the surface layer. The moisture content in the remainder of the heap leach

vertical profile will be a function of the ore materials ability to retain moisture. The field moisture capacity of any earthen material is a function of the grain size and the mineralogy of the materials. Accordingly, the 30% moisture content should be attained with all low grade ore materials, due to the presence of significant fine-grained materials. Furthermore, it may not be necessary to maintain the entire pile at 30% moisture content, but only the upper portion of the pile. The exact depth to which the 30% moisture content requirement would apply would be determined on a site by site basis. The cost to supply the water to replenish the pile's moisture content has been estimated below.

It is also recognized that imposing a 30% moisture content requirement on the pile might (and likely, would) require certain design changes to the pile. Principal concerns to be addressed during pile design are slope stability and the liquefaction potential. Regarding slope stability, many leach piles are provided with containment dikes which provide structural support to the pile. The 30% moisture content requirement will have little or no effect on the moisture associated with the containment dikes, and thus the dikes would continue to provide support. Additionally, the pile design may be altered to increase its stability. For example, lower slopes, higher confinement dikes, the construction of stair-step pad grade, or the installation of textured (as opposed to smooth) geomembrane liner in critical areas would enhance pile stability.

Regarding liquefaction potential, it has been estimated that liquefaction is unlikely if the degree of saturation in the pile is less than about 85% (Sassa 1985, as referred to in Smith 2002, Thiel and Smith 2004). Assuming a 2.7 ratio between moisture content and saturation (NRC 1984), the 30% moisture content require translates into 81% saturation, which is slightly below the level required for liquefaction. Needless to say, with the increase in the saturation that will result from the imposition of the 30% moisture content requirement, more attention will need to be paid to the pile design to minimize the liquefaction potential.

The costs associated with these design changes have not been included in the following cost estimate because any design change would depend very much on the site's characteristics, and in many cases the design change might be inexpensive to implement if it is identified during the design phase. For example, using a textured rather than smooth liner, constructing higher containment dikes, and using stair-step pad grade could all be incorporated into the pile's design at minimal, if any, additional cost.

Unit Water Cost

The unit costs for providing water to a heap leach pile are assumed to be the same as the unit costs developed in Section 6.3.3 (page 100) for providing water to nonconventional impoundments.

Cost of Soil Moisture Meters

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors (Irrometer 2010). The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft) (Ben Meadows 2012).

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair (Spectrum 2011, Spectrum 2012).

Total Annual Cost to Maintain 30% Moisture in the Heap Leach Pile

The only cost associated with maintaining the moisture level within the pile is the cost of the water. It is assumed that existing piping (used to supply lixiviant to the pile during leaching) would be used to supply water necessary for maintaining the moisture level. Also, it is assumed that the in-soil method for moisture monitoring would be used, and that the above costs are insignificant. Finally, it is assumed that moisture readings would be performed during the daily inspections of the heap pile (Visus 2009), with no additional workhours.

The base heap leach facility includes a heap pile that will occupy up to 80 acres at a height of up to 50 ft. With an assumed porosity of 0.39 (see Section 5.1.5, page 56) and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 50 presents the calculated cost for makeup water to maintain the moisture level in the heap pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates derived in Section 6.3.3 were used for this estimate.

Table 50: Heap Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of makeup water in perspective, during leaching and rinsing of the pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2) (Titan 2011), or about 4,220 in/yr. This application rate is almost two orders of magnitude larger than the mean net evaporation rate, and is over a factor of 40 larger than the maximum net evaporation rate, shown in Table 50, and should be sufficient to maintain the moisture content within the pile

Section 6.2.6 and Table 25 (page 89) present projections of the U_3O_8 production for the year 2035. Table 51 presents the annual cost for makeup water to maintain the heap pile's moisture content. Table 51 presents two cases. In the first case, Heap Only, it was assumed that heap leach facilities would produce all of the U_3O_8 required in 2035, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 51: Projected Annual Heap Pile Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)	
		Heap Only	Mix
Mean	Reference Nuclear	$15,000	$300
Median	Reference Nuclear	$14,000	$300
Minimum	Low Nuclear Production	$650	$20
Maximum	Reference Low Import	$66,000	$2,100

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for maintaining 30% moisture in the heap leach pile is well under 1% of the total cost of heap leach U_3O_8 production (i.e., $15,000/$356,000,000).

Total Annual Benefits from Maintaining 30% Moisture in the Heap Leach Pile

By requiring a minimum 30% by weight moisture content in the heap leach pile, the release of radon from these piles would be reduced by up to about a factor of 2½, as shown in Figure 15. From the base case production profile (BRS 2011, page 86), it can be determined that the heap pile ore has a mean U-238 concentration of 213 pCi/g, and a range of 135 to 321 pCi/g. Assuming the normalized radon flux from a heap pile with 30% moisture content is 1 pCi/(m^2-sec) per pCi/g Ra-226, and that the Ra-226 is in equilibrium with the U-238, then the mean annual radon release from the 80-acre heap pile would be 2,180 Ci/yr. A comparable annual radon release from a dryer heap pile could be as high as 5,450 Ci/yr. Table 52 shows a comparison of annual doses and risks using these heap pile annual radon releases and the release to dose/risk relationship for the Western Generic site from Table 13.

Table 52: Annual Dose and Risk Comparison for Maintaining 30% Moisture Content in the Heap Pile

Heap Pile Moisture Content (by Weight)	Radon Release (Ci/yr)	Annual Dose		LCF[(a)] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
>30%	2,180	6.3	7.5	3.4E-04	9.6E-06
<30%	5,450	16	19	8.4E-04	2.4E-05

* LCF = latent cancer fatalities

Of course the exact reduction will depend upon the specific heap pile. For example, if a heap pile is operating at 20% moisture content without the GACT, then according to Figure 15, imposing the GACT would result in a radon flux reduction of about a factor of 1.6. Also, as Figure 14 shows, the response of the radon emanation coefficient to increasing moisture is very dependent on the material. This relationship between the emanation coefficient, moisture content, and material also influences the amount of reduction provided by the GACT.

6.3.6 Summary of Proposed GACT Standards Economic Assessment

Sections 6.3.2 through 6.3.5 presents the details of the economic assessment that was performed for implementing each of the four proposed GACT standards. **Table 53** presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, **Table 53** presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of **Table 53**.

Table 53: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	—	—	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the **Table 53**, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

Included in the Section 6.2 descriptions is the operational duration and amount of uranium produced by each reference facility. This information from Section 6.2 has been used to calculate an annual U_3O_8 production rate for each type facility, which in turn has been coupled with the unit costs provided in **Table 53**, to generate the annual cost for implementing each GACT at each reference facility. These annual costs are presented in **Table 54**. Again for comparison the baseline cost (without the GACTs) is provided at the bottom of **Table 54** for each type facility.

Table 54: Proposed GACT Standards Reference Facility Annual Costs

	Reference Facility Annual Cost ($/yr)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$410,000	$2,900,000	$230,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$5,300	$9,700	$1,100
GACT – Liners for Heap Leach Piles	—	—	$2,100,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4,500
GACTs – Total for All Four	$420,000	$2,900,000	$2,300,000
Baseline Facility Costs	$21,000,000	$49,000,000	$48,000,000

Based on EIA (EIA 2011a) nuclear power productions, Section 6.2.6 estimated the U.S. U_3O_8 productions until the year 2035. Using those EIA-based production estimates for 2011 and 2035 and the unit cost values from **Table 53**, **Table 55** presents the estimated national annual cost for implementing the proposed GACTs.

Table 55: Proposed GACT Standards National Annual Costs

	National Annual Cost ($1,000/yr)			
	2011 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,500	$12,000	$0	$15,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$45	$40	$0	$85
GACT – Liners for Heap Leach Piles	—	—	$0	$0
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0	$0
GACTs – Total for All Four	$3,600	$12,000	$0	$15,000
Baseline Facility Costs	$180,000	$200,000	$0	$380,000
	2035 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,300	$11,000	$230	$14,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$42	$37	$1.1	$80
GACT – Liners for Heap Leach Piles	—	—	$2,100	$2,100
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4.5	$4.5
GACTs – Total for All Four	$3,300	$11,000	$2,300	$17,000
Baseline Facility Costs	$160,000	$190,000	$48,000	$400,000

Since no facilities were operating, it was assumed that all 2011 U_3O_8 production was divided between conventional and ISL facilities with the 2009 ratio, as shown in Table 25 (i.e., 47.3% conventional and 52.7% ISL). As described in Section 6.2.6, for 2035 it was assumed that one

heap leach facility would be operational, and that the remainder of the U_3O_8 production would be divided between conventional and ISL facilities with the 2009 ratio.

Of course, if the amount of U_3O_8 produced by each type facility changes the annual cost to implement the GACTs changes as well. For example if in 2035 all U_3O_8 is produced by ISL facilities, then the national annual cost to implement the GACTs would increase from $17 million (as shown in **Table 55**) to $24 million. Alternatively, if all 2035 U_3O_8 is produced by conventional facilities, then the national annual cost to implement the GACTs would decrease to $8.1 million. Because the baseline U_3O_8 production costs are fairly constant across all three types of uranium recovery facilities (see **Table 53** and Sections 6.2.1 through 6.2.4), the 2035 baseline U_3O_8 production national annual cost would remain fairly constant around $400 million, regardless of how the U_3O_8 is produced.

Table 56 presents the national cost for the implementation of the four proposed GACTs summed over the years 2011 to 2035. As with the **Table 55** annual national costs, the **Table 56** summed national costs are based on EIA (EIA 2011a) nuclear power productions, as described in Section 6.2.6.

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Non-Discounted			
	Conventional	ISL	Heap Leach	Total
GACT – Double Liners for Nonconventional Impoundments	$81,000	$270,000	$5,800	$350,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$1,000	$910	$27	$2,000
GACT – Liners for Heap Leach Piles	—	—	$52,000	$52,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$110	$110
GACTs – Total for All Four	$82,000	$270,000	$58,000	$410,000
Baseline Facility Costs	$4,000,000	$4,600,000	$1,200,000	$9,800,000
	Discounted @3%			
	Conventional	ISL	Heap Leach	Total
GACT – Double Liners for Nonconventional Impoundments	$58,000	$190,000	$4,100	$250,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$740	$650	$19	$1,400
GACT – Liners for Heap Leach Piles	—	—	$37,000	$37,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$80	$80
GACTs – Total for All Four	$59,000	$190,000	$41,000	$290,000
Baseline Facility Costs	$2,900,000	$3,300,000	$850,000	$7,000,000

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Discounted @ 7%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$40,000	$130,000	$2,900	$170,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$510	$450	$13	$970
GACT – Liners for Heap Leach Piles	—	—	$26,000	$26,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$55	$55
GACTs – Total for All Four	$41,000	$130,000	$29,000	$200,000
Baseline Facility Costs	$2,000,000	$2,300,000	$590,000	$4,800,000

As with the **Table 55** annual national costs, if the amount of U_3O_8 assumed to be produced by each type facility changes the **Table 56** summed national costs to implement the GACTs changes as well. For example if all U_3O_8 is produced by ISL facilities, then the non-discounted summed national cost to implement the GACTs would increase from $410 million (as shown in **Table 56**) to $590 million. Alternatively, if all U_3O_8 is produced by conventional facilities, then the non-discounted summed national cost to implement the GACTs would decrease to $200 million. Similar to the baseline annual national costs, the baseline U_3O_8 production non-discounted summed national cost would remain around $9.8 billion, regardless of how the U_3O_8 is produced.

6.4 Environmental Justice

Concerning environmental justice, EPA's economic assessment guidelines state:

> *Distributional analyses address the impact of a regulation on various subpopulations. Minority, low-income and tribal populations may be of particular concern and are typically addressed in an environmental justice (EJ) analysis. Children and other groups may also be of concern and warrant special attention in a regulatory impact analysis.* [EPA 2010, Section 10]

6.4.1 Racial Profile for Uranium Recovery Facility Areas

This section presents information on the racial (e.g., tribal populations) and economic (e.g., low income) profiles of the areas surrounding existing and proposed uranium recovery facilities.

Table 57 presents the racial profiles in the immediate areas (i.e., counties) surrounding the existing and proposed uranium recovery facilities, while Table 58 presents the profiles in the surrounding regional area (i.e., states) and on a national basis. A comparison of Table 57 to Table 58 indicates whether the racial population profile surrounding the uranium recovery facilities conform to the national and/or regional norms.

Table 57: Racial Profile for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	White	Black	Native American	Others
Juan Tafoya	Conventional	McKinley, NM	22.2%	0.4%	75.4%	2.0%
White Mesa Mill	Conventional	San Juan, UT	42.7%	0.1%	55.8%	1.3%
Grants Ridge	Heap Leach	Cibola, NM	56.2%	1.0%	40.9%	1.8%
Sheep Mountain	Heap Leach	Fremont, WY	78.3%	0.1%	19.8%	1.8%
Crow Butte	In-Situ Leach	Dawes, NE	94.5%	0.9%	3.0%	1.6%
Piñon Ridge	Conventional	Montrose, CO	96.6%	0.4%	1.4%	1.7%
Sweetwater Mill	Conventional	Sweetwater, WY	96.3%	0.8%	1.1%	1.9%
Christensen / Irigaray	In-Situ Leach	Campbell, WY	97.4%	0.2%	1.0%	1.4%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	97.5%	0.1%	1.0%	1.4%
Shootaring Canyon	Conventional	Garfield, CO	97.2%	0.5%	0.8%	1.6%
Kingsville Dome	In-Situ Leach	Kleberg, TX	92.8%	3.9%	0.8%	2.6%
Goliad	In-Situ Leach	Goliad, TX	93.6%	5.0%	0.7%	0.7%
Palangana	In-Situ Leach	Duval, TX	98.3%	0.6%	0.7%	0.4%
Alta Mesa	In-Situ Leach	Brooks, TX	98.8%	0.4%	0.6%	0.3%

Source: http://www.census.gov/popest/counties/asrh/

Table 58: Regional and National Racial Profiles

State		White	Black	Native American	Others
New Mexico	NM	85.4%	2.1%	9.8%	2.7%
Wyoming	WY	95.1%	0.8%	2.3%	1.8%
Utah	UT	94.0%	0.9%	1.4%	3.7%
Colorado	CO	90.7%	4.0%	1.2%	4.1%
Nebraska	NE	92.7%	4.1%	0.9%	2.3%
Texas	TX	83.7%	11.8%	0.7%	3.9%
United States	US	81.1%	12.7%	0.9%	5.3%

Source: http://www.census.gov/popest/counties/asrh/

At 10 of the 15 sites, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is White exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either Black or Other is less than the national norm, while the percentage of Blacks and Others is less than the regional norm at all but one site.

For all of the sites considered together, the data in Table 57 do not reveal a disproportionately high incidence of minority populations being located near uranium recovery facilities. However, certain individual sites may be located in areas with high minority populations. Those sites would need to be evaluated during their individual licensing processes.

6.4.2 Socioeconomic Data for Uranium Recovery Facility Areas

Table 59 shows the socioeconomic data for the immediate areas (i.e., counties) surrounding the existing and planned uranium recovery facilities. Specifically, the socioeconomic data shown in Table 59 is the fraction of land that is farmed, the value of that farmland, and the nonfarm per capita wealth. The percentages shown next to the value of that farmland and the nonfarm per capita wealth indicate where the site ranks when compared to all other counties in the United States.

Table 59: Socioeconomic Data for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	Farm Land	Farm Value Per Hectare		Per Capita Nonfarm Wealth	
White Mesa Mill	Conventional	San Juan, UT	31.1%	$670	4.0%	$103,073	0.6%
Juan Tafoya	Conventional	McKinley, NM	90.9%	$185	0.0%	$115,603	1.9%
Alta Mesa	In-Situ Leach	Brooks, TX	72.8%	$1,423	13.2%	$117,693	2.2%
Grants Ridge	Heap Leach	Cibola, NM	58.2%	$378	0.7%	$118,862	2.4%
Palangana	In-Situ Leach	Duval, TX	74.1%	$1,792	17.5%	$132,493	6.9%
Crow Butte	In-Situ Leach	Dawes, NE	88.0%	$895	6.9%	$144,291	15.1%
Kingsville Dome	In-Situ Leach	Kleberg, TX	0.0%	$1,478	13.9%	$149,865	20.4%
Goliad	In-Situ Leach	Goliad, TX	92.6%	$2,244	22.0%	$162,584	35.4%
Piñon Ridge	Conventional	Montrose, CO	23.3%	$2,916	30.1%	$181,133	59.5%
Sheep Mountain	Heap Leach	Fremont, WY	42.6%	$768	5.3%	$186,775	65.4%
Shootaring Canyon	Conventional	Garfield, CO	21.4%	$3,195	34.3%	$200,316	76.7%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	92.5%	$381	0.7%	$208,583	82.1%
Christensen/Irigaray	In-Situ Leach	Campbell, WY	97.3%	$437	1.1%	$225,858	89.3%
Sweetwater Mill	Conventional	Sweetwater, WY	22.2%	$242	0.1%	$232,504	91.2%

The discussion first focuses on the per capita nonfarm wealth. For comparison, the per capita nonfarm wealth in the United States ranges from $39,475 (Slope County, North Dakota) to $618,954 (New York County, New York). Table 59 shows that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are very well to do (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the 50th percentile in the United States. On the other hand, five sites are located in areas in which the per capita nonfarm wealth is below the country's 10th percentile.

Table 59 shows that eight of the sites have more than 50% of their land devoted to farming. However, the Table 59 farm value data show that the farmland for all 15 sites is below the 35th percentile farmland value in the United States. This could indicate that the farmland is of poor quality, or simply that the land is located in an economically depressed area. For comparison, farmland in the United States ranges in value from $185 per hectare (McKinley County, New Mexico, which is the location of the proposed Juan Tafoya uranium recovery facility) to $244,521 per hectare (Richmond County, New York).

For all of the sites combined, the data provided in Table 59 do not reveal a disproportionately high incidence of low-income populations being located near uranium recovery facilities. However, certain individual sites may be located within areas of low-income population. Those sites would need to be evaluated during their individual licensing processes.

6.5 Regulatory Flexibility Act

The Regulatory Flexibility Act requires federal departments and agencies to evaluate if and/or how their regulations impact small business entities. Specifically, the agency must determine if a regulation is expected to have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

If a rulemaking is determined to have a significant economic impact on a substantial number of small entities, then the agency must conduct a formal regulatory flexibility analysis. However, if the agency determines that a rulemaking does not have a significant economic impact on a substantial number of small entities, then it makes a certification of that finding and presents the analyses that it made to arrive at that conclusion.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with 40 CFR 192.32(a)(1) (see Section 5.4). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the agency is proposing to eliminate the distinction made in the 1989 rule between impoundments constructed pre-1989 and post-1989, since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored annually to demonstrate that the average Rn-222 flux does not exceed 20 pCi/(m^2-sec).

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are the White Mesa mill and the proposed Piñon Ridge mill owned by Energy Fuels; the Shootaring Canyon mill owned by Uranium One, Inc.; and the Sweetwater mill owned by Kennecott Uranium Co. . Of the three companies that own conventional mills, one, Energy Fuels, is classified as a small business, on the basis that they have fewer than 500 employees (EF 2012 states that Energy Fuels has 255 active employees in the U.S.).

Energy Fuels' White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full, it will be contoured and covered. Then, a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings.

Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Section 5.4 describes the proposed GACTs. Because both the White Mesa mill and the proposed Piñon Ridge mill are in compliance with the proposed GACT, it can be concluded that the rulemaking will not impose any new economic impacts on small business (i.e., Energy Fuels). For White Mesa, the proposed rule will actually result in a cost saving as Energy Fuels will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in 40 CFR 192.32(a)(1) and that a minimum depth of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to ISL facilities and heap leach facilities. Currently, there are six operating ISLs (as shown in Table 8) and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco; Alta Mesa owned by Mestena Uranium, LLC; Willow Creek owned by Uranium One, Inc.; and Hobson and La Palangana owned by Uranium Energy Corp. Again, using the criterion of fewer than 500 employees, Mestena Uranium, LLC, and Uranium Energy Corp. are small businesses, while both Cameco and Uranium One, Inc., which is owned by Rosatom, are large businesses.

All of the evaporation ponds at the four conventional mills and the six ISLs were built in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

In addition to the operating ISLs listed above, Table 9 shows that there are nine ISLs have been proposed for licensing. These are: Dewey Burdock owned by Powertech Uranium Corp.; Nichols Ranch owned by Uranerz Energy Corp.; 'Jab and Antelope' and Moore Ranch owned by Uranium One Americas, Inc., a subsidiary of Rosatom; Church Rock and Crownpoint owned by Hydro Resources, Inc. a subsidiary of Uranium Resources, Inc.; Ross owned by Strata Energy Inc., a subsidiary of Australian-based Peninsula Energy Limited; Goliad owned by Uranium Energy Corp.; and Lost Creek owned by Lost Creek ISR, LLC a subsidiary of Ur-Energy. All of these companies, except Rosatom, are small businesses.

According to the licensing documents submitted by the owners of the proposed ISLs, all will be constructed in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and while in standby status.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to \$0.03 per pound of U_3O_8 produced. Considering that the current (i.e., January 30, 2012) price of U_3O_8 is \$52 per pound (UxC 2012), this cost does not pose a significant impact to any of these small entities.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30-percent moisture content by weight during operations. Although no heap leach facilities are currently licensed, the small business Energy Fuels is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that has been presented (Titan 2011), the Energy Fuels facility will have an evaporation pond, a collection pond, and a raffinate pond. All three ponds will be double lined with leak detection. Based on the unit and facility cost comparisons presented in **Table 53** and **Table 54**, respectively, the implementation of the proposed GACTs at a heap leach facility (such as Sheep Mountain) would increase the U_3O_8 production cost by about 5%. Based on this small increase, the Sheep Mountain Project would: 1) remain competitive with U_3O_8 production cost for other types of facilities, and 2) continue to provide Energy Fuels with a profit. Energy Fuels is the only entity known to be preparing to submit a license application for a heap leach facility.

Of the 20 uranium recovery facilities identified above, 13 are owned by small businesses. As documented above in this report, those 13 facilities are either already in compliance with the proposed GACTs, with no additional impact, or compliance with the GACTs would not pose a significant impact to any of the small businesses (e.g., \$52.03 lb^{-1} versus \$52 lb^{-1}). Thus, after considering the economic impacts of this proposed rule on small entities, it is concluded that this action will not have a significant economic impact on a substantial number of small entities.

7.0 REFERENCES

10 CFR 20. Title 10 of the *Code of Federal Regulations*, Part 20, "Standards for Protection Against Radiation."

10 CFR 40. Title 10 of the *Code of Federal Regulations*, Part 40, "Domestic Licensing of Source Material."

40 CFR 61. Title 40 of the *Code of Federal Regulations*, Part 61, "National Emission Standards for Hazardous Air Pollutants," Subpart W, "National Emission Standards for Radon Emissions from Operating Mill Tailings."

40 CFR 190. Title 40 of the *Code of Federal Regulations*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

40 CFR 192, Title 40 of the *Code of Federal Regulations*, Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

40 CFR 264, Title 40, Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities."

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Subpart W Stakeholders Conference Call
April 3, 2014

ATTENDEES

EPA: Reid Rosnick, Susan Stahle (OGC), Angelique Diaz (Region 8)

Environmental Groups/Tribes: Sarah Fields, Uranium Watch; Aaron Mentzes, Earthworks; Paul Robinson, SW Research and Information Center; Scott Clow, Mike King, Ute Mountain Ute Tribe

Uranium Industry/Other: Jim Cain, Cotter; Scott Bakken, Cameco; Richard Bluebaugh, Powertech; Darrel Lyles, SENES; Richard Potter

UPDATE

Reid began the call with a welcome and by taking attendance. Reid had a couple of items to share.

EPA has addressed the comments from OMB staff and other interagency comments successfully. OMB staff has cleared the draft rulemaking and it was reviewed by OMB management. OMB officially cleared the draft proposed rulemaking on January 13, 2014. The package was returned to EPA, where several housekeeping items were be addressed, and the package began its trip to the Administrator's office for signature. After signature the proposed rule will be sent to the Office of the Federal Register for publication, probably this month.

DISCUSSION

Sarah: How long is the comment period?
Reid: 90 days

Scott: Has EPA considered placing the rule (when it's published) on the American Indian Environmental Office (AIEO) portion of EPA's website? Reid will look into it. Joann Chase is a contact in AIEO.

There was a request for a summary of what is in the proposed rule. Reid stated that that information cannot be released until after the proposal has been published in the Federal Register.

Question on if the proposed rule… will it include response to comments received – Reid clarified the process. The final rulemaking will include a response to all the comments in the preamble or a separate document, depending on the volume of comments. You will see some comments received to date addressed in the rule.

Sarah – Will it go on the federal rulemaking website? www.regulations.gov Reid – yes, the rulemaking will have a specific number and you can either 1. Submit a comment or 2. Read other comments at that website.

Sarah –Any idea of schedule after comments received? Reid – it will depend on the scope of the comments and if they have been addressed already or not.

Darryl – Joined late and asked for a process update. Reid – summarized info stated in his update.

Next call: Thursday, July 3, 2014 at 11 AM Eastern Time.

____________________________________end_____________________________________

EPA-3241

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W Proposed Rule.msg

- Subpart W Proposed Rule.msg

From: Rosnick, Reid
Sent: Monday, April 21, 2014 2:21 PM
To: sarah@uraniumwatch.org
Subject: Subpart W Proposed Rule

Hello Sarah,

FYI, the signed copy of the Subpart W proposed rule is now on our website at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html. Please note that this is the prepublication version, and that as soon as the proposal is published in the Federal Register we will replace it and begin the 90 day comment period. Thank you.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-2972

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule.msg

- FW Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule.msg

From: Ferguson, Rafaela
Sent: Thursday, April 17, 2014 5:48 PM
To: Aquino, Marcos; BANDROWSKI, MIKE; Barnette, Jack; Barry, Michael; Brozowski, George; Button, Rich; Compher, Michael; Croke, Harriet; Debonis, Michael; Dettling, Diane; Diaz, Angelique; Dye, Robert; Febbo, carol; Generette, Lloyd; Giardina, Paul; Graham, Richard; Honnellio, Anthony; Hooper, Charles A.; Knutson, Lingard; Koehler, Larainne; Murphy, Michael; Povetko, Oleg; Richards, Jon M.; Rinck, Todd; Rosenblum, Shelly; Schulingkamp, Cristina; Snowbarger, Robert; Terry, Robert; Mahler, Tom; Tyson, MaryPat; Wagner, Christine; Waldon, MARGARET; Wood, Periann; Zhen, Davis
Cc: Rosnick, Reid
Subject: FW: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule
Importance: High

Good Afternoon Everyone,

I'm forwarding an FYI update on the NESHAP Subpart W rule action. Reid sent out this update to some of you already earlier today. I just wanted to make sure that all of you are aware of this action and that it will be signed soon and published in the FR in the next 2 or 3 weeks.

Rafie

From: Peake, Tom
Sent: Thursday, April 17, 2014 5:15 PM
To: Ferguson, Rafaela
Subject: FW: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 9:49 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis; Diaz, Angelique; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
Subject: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

PER ADMINISTRATOR's REPORT---OAR will be releasing/signing a revision to propose Limiting Radon Emissions from Uranium Mill Tailings to an existing Hazardous Air Pollutants Rule soon. OAR anticipates industry to challenge the rule.

There are 12 existing facilities that are currently operating at a technology-based standard. Air program indicated states/tribes will generally be supportive (**YES**), industry opposed **(YES, may challenge the portions of the rule)**, environs in favor **(likely express frustration that the timeline the EPA used did not result in a new form of the standard and that the Agency is proposing a technology-based standard.)**

Where are the 12 facilities located (city, state)?

White Mesa Mill, Blanding, UT
Shootaring Canyon, Ticaboo, UT
Sweetwater Mill, Rawlins, WY
Alta Mesa, Brooks County TX
Crow Butte, Dawes County, NE
Hobson/La Palangana, South TX
Willow Creek, Christensen, WY
Smith Ranch, Converse County, WY
Uranium One, Luderman, WY
Lost Creek, Lost Creek, NE
Cameco, Marsland, NE
Powertech, Dewey Burdock, SD

As soon as the rule has been signed I will forward a copy.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3101

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule.msg

- RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule.msg

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 12:19 PM
To: Brozowski, George
Subject: RE: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

Hi George,

I wouldn't share until it's been signed, but you could tell them it's imminent. Happy Easter to you!

Reid

From: Brozowski, George
Sent: Thursday, April 17, 2014 12:07 PM
To: Rosnick, Reid
Subject: RE: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

Good morning from Hobbs, NM! Out here doing work on WIPP for the past 11 days.

Can your emails (in any/all part) be shared with folks in TX? Thanks and Happy Easter from our family to yours.

George P. Brozowski | 214-665-8541| 214-755-1530 cell

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 8:49 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis; Diaz, Angelique; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
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Willow Creek, Christensen, WY
Smith Ranch, Converse County, WY
Uranium One, Luderman, WY
Lost Creek, Lost Creek, NE
Cameco, Marsland, NE
Powertech, Dewey Burdock, SD

As soon as the rule has been signed I will forward a copy.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3037

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\NMA & tribal consult.msg

- NMA & tribal consult.msg

From: Cherepy, Andrea
Sent: Thursday, April 17, 2014 10:09 AM
To: Rosnick, Reid
Cc: Peake, Tom
Subject: NMA & tribal consult

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- *Presentation for NMA's recovery workshop in June*. Tom indicated that the presentation will focus mostly on Subpart W, but should also include about three slides on 192. Tom is thinking one person will present the material...probably Phil since he is the only one currently slated to attend. I'll start on the slides this week.
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- Kiowa Tribe of Oklahoma
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- Northern Cheyenne
- Rosebud Sioux
- Pawnee Nation of Oklahoma
- Santee Sioux Nation
- Shawnee
- Shoshoni-Bannock
- Spirit Lake Tribe
- Turtle Mountain Chippewa
- Three Affiliated Tribes

Let me know if you have any questions or concerns,
Andrea
p.s. teleworking today: (202) 570-2393

EPA-3098

Reid Rosnick

To	
cc	
bcc	
Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule (1).msg

- RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule (1).msg

From: Walker, Stuart
Sent: Thursday, April 17, 2014 10:45 AM
To: Rosnick, Reid
Subject: RE: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

Congrats Reid

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 9:49 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis; Diaz, Angelique; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
Subject: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

PER ADMINISTRATOR's REPORT---OAR will be releasing/signing a revision to propose Limiting Radon Emissions from Uranium Mill Tailings to an existing Hazardous Air Pollutants Rule soon. OAR anticipates industry to challenge the rule.

There are 12 existing facilities that are currently operating at a technology-based standard. Air program indicated states/tribes will generally be supportive (**YES**), industry opposed **(YES, may challenge the portions of the rule)**, environs in favor **(likely express frustration that the timeline the EPA used did not result in a new form of the standard and that the Agency is proposing a technology-based standard.)**

Where are the 12 facilities located (city, state)?
White Mesa Mill, Blanding, UT
Shootaring Canyon, Ticaboo, UT
Sweetwater Mill, Rawlins, WY
Alta Mesa, Brooks County TX
Crow Butte, Dawes County, NE
Hobson/La Palangana, South TX
Willow Creek, Christensen, WY
Smith Ranch, Converse County, WY
Uranium One, Luderman, WY
Lost Creek, Lost Creek, NE
Cameco, Marsland, NE
Powertech, Dewey Burdock, SD

As soon as the rule has been signed I will forward a copy.

Reid

____
Reid J. Rosnick
US Environmental Protection Agency

Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3099

Reid Rosnick	To	
	cc	
	bcc	
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule (3).msg

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Sent: Thursday, April 17, 2014 10:45 AM
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Subject: RE: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

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Reid

____
Reid J. Rosnick
US Environmental Protection Agency

Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3100

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule (4).msg

- RE Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule (4).msg

From: Dye, Robert
Sent: Thursday, April 17, 2014 9:52 AM
To: Rosnick, Reid
Cc: Jay, Michael
Subject: RE: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

This is the first time I have heard of Lost Creek and Cameco, Marsland, both in Nebraska. Do you have any information about them? I had only heard about Crow Butte both for subpart W and 192. thanks

Robert Dye
Radiation & Indoor Air
EPA Region 7
11201 Renner Blvd
Lenexa, KS 66219
913-551-7605
dye.robert@epa.gov

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 8:49 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis; Diaz, Angelique; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
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Reid J. Rosnick
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Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3126

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE NMA & tribal consult (2).msg

- RE NMA & tribal consult (2).msg

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 10:35 AM
To: Cherepy, Andrea
Subject: RE: NMA & tribal consult

Hi Andrea,

I'll get started on my part of the NMA presentation in the next week or so. The meeting isn't until June 18 so we have a little time. I'll probably outline what's in the proposal and give all the ways one can provide comments. I'll add the hearing date if it hasn't passed.

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I'm in the office today and possibly tomorrow. I'm feeling pretty good right now. I had 2 injections in my back last week and now I've begun injecting myself with Humira, a biologic drug for arthritis. Between these things and the 6 or 7 other drugs I'm taking I'm able to sit in the chair for longer than an hour ☺

Reid

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Cc: Peake, Tom
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- Turtle Mountain Chippewa
- Three Affiliated Tribes

Let me know if you have any questions or concerns,
Andrea

p.s. teleworking today: (202) 570-2393

EPA-3127

Reid Rosnick

To	
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Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE NMA & tribal consult.msg

- RE NMA & tribal consult.msg

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- Three Affiliated Tribes

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Andrea

p.s. teleworking today: (202) 570-2393

EPA-2943

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281) (7).msg

- FW APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281) (7).msg

From: Rosnick, Reid
Sent: Wednesday, April 16, 2014 7:41 AM
To: Nesky, Anthony
Cc: Herrenbruck, Glenna
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Hi Tony,

We are getting close to signature on the Subpart W rule. We'll need to get started on the hearing process.

Reid

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
Regulatory Management Division
Office of Policy
US Environmental Protection Agency
1200 Pennsylvania Ave NW (1806A)
Washington, DC 20460
(202) 564-2855
muellerleile.caryn@epa.gov

ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other

information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990

CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1 x 10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1 x 10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be

available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment

of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and

(d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to

major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and

[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology

[5] http://www.epa.gov/radon/risk_assessment.html.

produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is

processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as “acid” or “alkaline” systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.
H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or

covered.[12]" Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to "new" impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989,

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[12] See 54 FR 51689.

unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the

tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40

acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent

subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the

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[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 $pCi/m^2/sec$. The radon flux for the entire tailings impoundment was calculated to be 6.01 $pCi/m^2/sec$. The calculated radon flux

from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture

associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at

[17] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19]

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[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area

limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40

acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill

Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in

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[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

40 CFR part 192 to the emissions levels of 20 $pCi/m^2/sec$. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one

located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery

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[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities.

[26] See 54 FR 51656

Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous

disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and

are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40,

Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This

liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap

leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is

difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions

from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no

more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be

available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are

also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-

effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous

one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-

keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in

inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for
Proposed Recordkeeping Requirements
(Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*

Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required

to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the

requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT - Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT - Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT - Liners for Heap Leach Piles	–	–	$2.01
GACT - Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs - Total for All Four	$1.05	$3.08	$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the

phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable

approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is

about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that <u>all</u> conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional

impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility’s life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:			
	A	=	Radon attenuation factor (unit less)
	λ	=	Radon-222 decay constant (sec^{-1})
		=	2.1×10^{-6} sec^{-1}
	D	=	Radon diffusion coefficient (cm^2/sec)
		=	0.003 cm^2/sec in water
	d	=	Depth of water (cm)
		=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as "process water" from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain

one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the

ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to

be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%,

the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until

the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no “process water” component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three

potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be

performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution

applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap

leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of

uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a

pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not “new tailings.” The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of “operation” in the Subpart W definitions at 40 CFR 61.251 as follows:

<u>Operation</u> means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. <u>Weather Events</u>

In the past, uranium recovery facilities have been located in the western regions of the United States. In

these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section

264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency

administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule’s air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis

report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate

(without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	\$0.013	\$0.010	\$0.0010
GACT – Liners for Heap Leach Piles	–	–	\$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	\$0.0043
GACTs – Total for All Four	\$1.05	\$3.08	\$2.24
Baseline Facility Costs (Section 6.2)	\$51.56	\$52.49	\$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two

proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total

annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost

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[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these

requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would

require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule

would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the

impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made

concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility’s expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium

recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is

independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between

impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses,

while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these

three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on

small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the

potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB,

explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40

CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

EPA-2944

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281) (8).msg

- FW APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281) (8).msg

From: Rosnick, Reid
Sent: Tuesday, April 15, 2014 7:27 PM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Good News!

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:58 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
Regulatory Management Division
Office of Policy
US Environmental Protection Agency
1200 Pennsylvania Ave NW (1806A)
Washington, DC 20460
(202) 564-2855
muellerleile.caryn@epa.gov

ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**].**

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other

information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990

CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be

available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment

of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from

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[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and

(d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. <u>What criteria did EPA use in developing the proposed GACT standards for these area sources</u>?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to

major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and

[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology

[5] http://www.epa.gov/radon/risk_assessment.html.

produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is

processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as “acid” or “alkaline” systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

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[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

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[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or

covered.[12]" Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to "new" impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989,

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[12] See 54 FR 51689.

unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the

tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40

acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent

subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux

from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture

associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at

[17] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19]

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[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area

limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40

acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 $pCi/m^2/sec$ will no longer be required for the impoundments in existence prior to December 15, 1989.

G. <u>How does this action relate to other EPA standards?</u>

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill

Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one

located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

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[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery

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[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities.

[26] See 54 FR 51656

Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous

disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and

are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40,

Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This

liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap

leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is

difficult to determine whether there is any contribution above background radon values. EPA has stated in the ***Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document*** (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions

from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no

more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be

available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are

also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-

effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous

one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-

keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in

inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for Proposed Recordkeeping Requirements (Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*

Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required

to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the

requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the

phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable

approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is

about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that <u>all</u> conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous

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[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional

impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:			
	A	=	Radon attenuation factor (unit less)
	λ	=	Radon-222 decay constant (sec^{-1})
		=	2.1×10^{-6} sec^{-1}
	D	=	Radon diffusion coefficient (cm^2/sec)
		=	0.003 cm^2/sec in water
	d	=	Depth of water (cm)
		=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

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[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment’s operator.

The most obvious source of water is what is known as “process water” from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain

one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the

ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to

be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%,

the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until

the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three

potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be

performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution

applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap

leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term "standby" and how it relates to the operational phase of an impoundment;
- Amending the definition of "operation" of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase "as determined by the Nuclear Regulatory Commission" in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term "Standby"

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in "standby" mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the "closure period" as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of

uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a

pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In

these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section

264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency

administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule’s air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis

report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate

(without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two

proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total

annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these

requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would

require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule

would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the

impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made

concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility’s expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium

recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is

independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between

impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses,

while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these

three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on

small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the

potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB,

explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40

CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

EPA-2945

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281).msg

- FW APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281).msg

From: Rosnick, Reid
Sent: Wednesday, April 16, 2014 7:43 AM
To: Miller, Beth
Cc: Herrenbruck, Glenna
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Hi Beth,

We're getting close to signature on the Subpart W rule. Is the process for getting the docket live a lengthy one?

Reid

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
Regulatory Management Division
Office of Policy
US Environmental Protection Agency
1200 Pennsylvania Ave NW (1806A)
Washington, DC 20460
(202) 564-2855
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ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket’s normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other

information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information
- A. Does this action apply to me?
- B. What should I consider as I prepare my comments to EPA?
- C. Acronyms and Abbreviations

G. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks
H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution or Use
I. National Technology Transfer Advancement Act
J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990

CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be

available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment

of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and

(d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to

major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or

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[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and

[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology

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[5] http://www.epa.gov/radon/risk_assessment.html.

produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is

processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as “acid” or “alkaline” systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.
[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

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[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or

covered.[12]” Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to “new” impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989,

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[12] See 54 FR 51689.

unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the

tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40

acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent

subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 $pCi/m^2/sec$. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux

from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture

associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at

[17] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19]

[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area

limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40

acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. <u>How does this action relate to other EPA standards?</u>

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill

Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in

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[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one

located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

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[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery

[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities.

[26] See 54 FR 51656

Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous

disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and

are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40,

Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This

liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap

leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is

difficult to determine whether there is any contribution above background radon values. EPA has stated in the ***Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document*** (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions

from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no

more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be

available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are

also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-

effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous

one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-

keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in

inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for
Proposed Recordkeeping Requirements
(Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*

Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required

to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the

requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT - Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT - Maintaining 1 Meter of Water in Nonconventional Impoundments	\$0.013	\$0.010	\$0.0010
GACT - Liners for Heap Leach Piles	–	–	\$2.01
GACT - Maintaining Heap Leach Piles at 30% Moisture	–	–	\$0.0043
GACTs - Total for All Four	\$1.05	\$3.08	\$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the

phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable

approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is

about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional

impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A	=	Radon attenuation factor (unit less)
λ	=	Radon-222 decay constant (sec^{-1})
	=	2.1×10^{-6} sec^{-1}
D	=	Radon diffusion coefficient (cm^2/sec)
	=	0.003 cm^2/sec in water
d	=	Depth of water (cm)
	=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as "process water" from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain

one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the

ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to

be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%,

the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until

the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no “process water” component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three

potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be

performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution

applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap

leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of

uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a

pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In

these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section

264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency

administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule’s air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis

report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate

(without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT - Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT - Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT - Liners for Heap Leach Piles	–	–	$2.01
GACT - Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs - Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two

proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total

annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these

requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would

require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule

would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the

impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made

concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility’s expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium

recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is

independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between

impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses,

while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these

three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on

small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the

potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB,

explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____

Dated:

____

Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40

CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

EPA-3069

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281) (6).msg

- Re APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281) (6).msg

From: Flynn, Mike
Sent: Wednesday, April 16, 2014 7:42 AM
To: Perrin, Alan; Rosnick, Reid; Peake, Tom
Cc: Edwards, Jonathan
Subject: Re: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Congrats all!

From: Perrin, Alan
Sent: Wednesday, April 16, 2014 6:40:36 AM
To: Flynn, Mike
Cc: Edwards, Jonathan
Subject: Fw: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

FYI

From: Rosnick, Reid
Sent: Tuesday, April 15, 2014 7:26:45 PM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Good News!

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:58 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
Regulatory Management Division
Office of Policy
US Environmental Protection Agency
1200 Pennsylvania Ave NW (1806A)
Washington, DC 20460

(202) 564-2855
muellerleile.caryn@epa.gov

EPA-3070

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281).msg

- RE APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281).msg

From: Rosnick, Reid
Sent: Wednesday, April 16, 2014 10:26 AM
To: Nesky, Anthony
Subject: RE: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

The most recent information I've seen predicts today or tomorrow. I assume after that it will be a few days until its published in the FR.

From: Nesky, Anthony
Sent: Wednesday, April 16, 2014 10:19 AM
To: Rosnick, Reid
Subject: RE: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Great! Do you have any predictions about when this might be signed?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
Sent: Wednesday, April 16, 2014 7:41 AM
To: Nesky, Anthony
Cc: Herrenbruck, Glenna
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Hi Tony,

We are getting close to signature on the Subpart W rule. We'll need to get started on the hearing process.

Reid

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
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EPA-2901

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281).msg

- APPROVED for SIGNATURE - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings (5281).msg

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
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ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA’s determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other

information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

G. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks
H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution or Use
I. National Technology Transfer Advancement Act
J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990

CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be

available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment

of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and

(d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to

major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and

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[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology

[5] http://www.epa.gov/radon/risk_assessment.html.

produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is

processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as “acid” or “alkaline” systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

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[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or

covered.[12]" Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to "new" impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989,

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[12] See 54 FR 51689.

unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the

tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40

acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent

subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 $pCi/m^2/sec$. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 $pCi/m^2/sec$. The radon flux for the entire tailings impoundment was calculated to be 6.01 $pCi/m^2/sec$. The calculated radon flux

from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture

associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at

[17] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19]

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[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area

limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40

acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill

Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

40 CFR part 192 to the emissions levels of 20 $pCi/m^2/sec$. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one

located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

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[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery

[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1 x 10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4 x 10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities.

[26] See 54 FR 51656

Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous

disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and

are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40,

Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This

liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap

leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is

difficult to determine whether there is any contribution above background radon values. EPA has stated in the ***Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document*** (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions

from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no

more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be

available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are

also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. <u>What are the monitoring requirements?</u>

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-

effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous

one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-

keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in

inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for Proposed Recordkeeping Requirements (Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*

Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required

to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the

requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT - Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT - Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT - Liners for Heap Leach Piles	–	–	$2.01
GACT - Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs - Total for All Four	$1.05	$3.08	$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the

phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable

approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is

about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional

impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:			
	A	=	Radon attenuation factor (unit less)
	λ	=	Radon-222 decay constant (sec^{-1})
		=	2.1×10^{-6} sec^{-1}
	D	=	Radon diffusion coefficient (cm^2/sec)
		=	0.003 cm^2/sec in water
	d	=	Depth of water (cm)
		=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment’s operator.

The most obvious source of water is what is known as “process water” from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain

one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the

ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to

be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%,

the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until

the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three

potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be

performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution

applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap

leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of

uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a

pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not “new tailings.” The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of “operation” in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In

these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section

264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency

administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule’s air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis

report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate

(without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two

proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total

annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost

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[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these

requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would

require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule

would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the

impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made

concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility’s expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium

recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is

independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between

impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses,

while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these

three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on

small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the

potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB,

explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40

CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

EPA-3018

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Uranium rules (12).msg

- FW Uranium rules (12).msg

From: Rosnick, Reid
Sent: Friday, April 11, 2014 10:41 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Subject: FW: Uranium rules

FYI, Below. I believe only Caryn Muellerleile's side of OP is left in the chain. When I spoke with her on Wednesday she said they were still reviewing the ICR.

Reid

From: Elman, Barry
Sent: Friday, April 11, 2014 10:35 AM
To: Rosnick, Reid
Subject: Uranium rules

Reid,

I've completed my review of the proposed Subpart W rule. It looks good. I have no further changes to suggest and will clear the rule today.

I'm realizing that I never got back to you on the minor edit that your office wanted to make. I did check and was told there would be no problem with a small non-substantive edit of that sort. Sorry for not closing the loop with you on that. I'm glad to see that the edit is included in this package.

Barry

EPA-3019

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Uranium rules.msg

- FW Uranium rules.msg

From: Peake, Tom
Sent: Friday, April 11, 2014 10:50 AM
To: Perrin, Alan; Edwards, Jonathan
Cc: Rosnick, Reid; Schultheisz, Daniel
Subject: FW: Uranium rules

More good news, hopefully.
Tom

From: Cherepy, Andrea
Sent: Friday, April 11, 2014 10:40 AM
To: Peake, Tom
Subject: FW: Uranium rules

FYI -

From: Elman, Barry
Sent: Friday, April 11, 2014 10:38 AM
To: Cherepy, Andrea
Subject: Uranium rules

Andrea,

Sorry for not responding to your voicemail sooner. I just sent Reid an email letting him know that I've completed my review of the proposed Subpart W rule and will clear it today. I'm also hoping to complete my review of your rule today.

Barry

EPA-3204

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Uranium rules.msg

- RE Uranium rules.msg

From: Rosnick, Reid
Sent: Friday, April 11, 2014 10:41 AM
To: Elman, Barry
Subject: RE: Uranium rules

Thank you, Barry!

From: Elman, Barry
Sent: Friday, April 11, 2014 10:35 AM
To: Rosnick, Reid
Subject: Uranium rules

Reid,

I've completed my review of the proposed Subpart W rule. It looks good. I have no further changes to suggest and will clear the rule today.

I'm realizing that I never got back to you on the minor edit that your office wanted to make. I did check and was told there would be no problem with a small non-substantive edit of that sort. Sorry for not closing the loop with you on that. I'm glad to see that the edit is included in this package.

Barry

EPA-3255

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Uranium rules.msg

- Uranium rules.msg

From: Elman, Barry
Sent: Friday, April 11, 2014 10:35 AM
To: Rosnick, Reid
Subject: Uranium rules

Reid,
I've completed my review of the proposed Subpart W rule. It looks good. I have no further changes to suggest and will clear the rule today.
I'm realizing that I never got back to you on the minor edit that your office wanted to make. I did check and was told there would be no problem with a small non-substantive edit of that sort. Sorry for not closing the loop with you on that. I'm glad to see that the edit is included in this package.
Barry

EPA-2960

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Entering Consultation into TCOTS (16).msg

- FW Entering Consultation into TCOTS (16).msg

From: Cherepy, Andrea
Sent: Wednesday, April 09, 2014 9:30 AM
To: Rosnick, Reid
Subject: FW: Entering Consultation into TCOTS
Importance: High

Reid,

Sounds like a decision has been made to input (as draft) the Subpart W proposal with the Ute Mountain Ute tribe. The information will not be viewable to the public until we provide the consultation letter and finalize the information in TCOTS.

Toni needs the following information asap: topic, lead office, contact and scope. Take a look at what I pulled together and let me know if you have any changes before this goes to Toni. If you'd like to see what others have input, go to: http://tcots.epa.gov/oita/TConsultation.nsf/TC?OpenView.

Topic: Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants – Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)
Lead Office: OAR
Contact: Reid Rosnick
202-343-9563
Rosnick.Reid@epa.gov
Scope: Regional

Thank you,
Andrea

From: Colon, Toni
Sent: Wednesday, April 09, 2014 9:12 AM
To: Cherepy, Andrea
Subject: Entering Consultation into TCOTS
Importance: High

Hi Andrea,

Following my voice message, I will enter your action into TCOTS as a draft. That way we will satisfy the semi-annual reporting requirements but do not have to publish the action until we are ready to move forward.

What I need from you is the lead name on the action, the formal title of the action and whether it is a rulemaking, guidance, regulation, etc.

Once you have a consultation letter, send it to me and I'll add it to the record and then have it published for the tribes to see.

Thanks!

Toni Colón
OAQPS Tribal Consultation Advisor (TCA)
Community & Tribal Programs Group,
Office of Air Quality Planning & Standards,
Office of Air & Radiation,
U.S. Environmental Protection Agency
Tel: (919) 541-0069/**Fax:** (919) 541-0942
OAR Tribal Air Website
Alone we can do so little; together we can do so much. —Helen Keller

EPA-2961

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Entering Consultation into TCOTS.msg

- FW Entering Consultation into TCOTS.msg

From: Cherepy, Andrea
Sent: Thursday, April 10, 2014 8:28 AM
To: Peake, Tom
Cc: Rosnick, Reid
Subject: FW: Entering Consultation into TCOTS

Tom,
In case it comes up in your General with Jon today, Reid and I took care of the request that came down to input the Subpart W consultation with the Ute Mountain Ute tribe into the Agency's TCOTS database. The information in the database will remain in draft form until the actual letter goes out to the tribe.
Please let me know if you have any questions,
Andrea

From: Harrison, Jed
Sent: Wednesday, April 9, 2014 10:09 AM
To: Cherepy, Andrea; Colon, Toni
Cc: Rosnick, Reid; Childers, Pat
Subject: RE: Entering Consultation into TCOTS

Thanks for getting this done! (and keeping me in the loop!)

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Cherepy, Andrea
Sent: Wednesday, April 09, 2014 7:05 AM
To: Colon, Toni
Cc: Rosnick, Reid; Harrison, Jed; Childers, Pat
Subject: RE: Entering Consultation into TCOTS
Toni,
Thank you for offering to input our tribal consultation information into TCOTS as draft. Here are the specifics for the Ute Mountain Ute consultation –
Topic: Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants – Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)
Lead Office: OAR
Contact: Reid Rosnick

202-343-9563
Rosnick.Reid@epa.gov
Scope: Regional
We will contact you again when ready to send out the letter.
Thanks again,
Andrea
Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov
From: Colon, Toni
Sent: Wednesday, April 09, 2014 9:12 AM
To: Cherepy, Andrea
Subject: Entering Consultation into TCOTS
Importance: High
Hi Andrea,
Following my voice message, I will enter your action into TCOTS as a draft. That way we will satisfy the semi-annual reporting requirements but do not have to publish the action until we are ready to move forward.

What I need from you is the lead name on the action, the formal title of the action and whether it is a rulemaking, guidance, regulation, etc.

Once you have a consultation letter, send it to me and I'll add it to the record and then have it published for the tribes to see.
Thanks!

Toni Colón
OAQPS Tribal Consultation Advisor (TCA)
Community & Tribal Programs Group,
Office of Air Quality Planning & Standards,
Office of Air & Radiation,
U.S. Environmental Protection Agency
Tel: (919) 541-0069/**Fax:** (919) 541-0942
OAR Tribal Air Website
Alone we can do so little; together we can do so much. —Helen Keller

EPA-3083

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Entering Consultation into TCOTS (15).msg

- RE Entering Consultation into TCOTS (15).msg

From: Cherepy, Andrea
Sent: Wednesday, April 09, 2014 10:05 AM
To: Colon, Toni
Cc: Rosnick, Reid; Harrison, Jed; Childers, Pat
Subject: RE: Entering Consultation into TCOTS

Toni,

Thank you for offering to input our tribal consultation information into TCOTS as draft. Here are the specifics for the Ute Mountain Ute consultation –

Topic: Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants – Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)
Lead Office: OAR
Contact: Reid Rosnick
202-343-9563
Rosnick.Reid@epa.gov
Scope: Regional

We will contact you again when ready to send out the letter.

Thanks again,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

From: Colon, Toni
Sent: Wednesday, April 09, 2014 9:12 AM
To: Cherepy, Andrea
Subject: Entering Consultation into TCOTS
Importance: High

Hi Andrea,

Following my voice message, I will enter your action into TCOTS as a draft. That way we will satisfy the semi-annual reporting requirements but do not have to publish the action until we are ready to move forward.

What I need from you is the lead name on the action, the formal title of the action and whether it is a rulemaking, guidance, regulation, etc.

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Toni Colón
OAQPS Tribal Consultation Advisor (TCA)
Community & Tribal Programs Group,
Office of Air Quality Planning & Standards,
Office of Air & Radiation,
U.S. Environmental Protection Agency
Tel: (919) 541-0069/**Fax:** (919) 541-0942
OAR Tribal Air Website
Alone we can do so little; together we can do so much. —Helen Keller

EPA-3084

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Entering Consultation into TCOTS.msg

- RE Entering Consultation into TCOTS.msg

From: Harrison, Jed
Sent: Wednesday, April 09, 2014 10:10 AM
To: Cherepy, Andrea; Colon, Toni
Cc: Rosnick, Reid; Childers, Pat
Subject: RE: Entering Consultation into TCOTS

Thanks for getting this done! (and keeping me in the loop!)

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Cherepy, Andrea
Sent: Wednesday, April 09, 2014 7:05 AM
To: Colon, Toni
Cc: Rosnick, Reid; Harrison, Jed; Childers, Pat
Subject: RE: Entering Consultation into TCOTS

Toni,

Thank you for offering to input our tribal consultation information into TCOTS as draft. Here are the specifics for the Ute Mountain Ute consultation –

Topic: Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants – Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)
Lead Office: OAR
Contact: Reid Rosnick
202-343-9563
Rosnick.Reid@epa.gov
Scope: Regional

We will contact you again when ready to send out the letter.

Thanks again,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

From: Colon, Toni
Sent: Wednesday, April 09, 2014 9:12 AM
To: Cherepy, Andrea
Subject: Entering Consultation into TCOTS
Importance: High

Hi Andrea,

Following my voice message, I will enter your action into TCOTS as a draft. That way we will satisfy the semi-annual reporting requirements but do not have to publish the action until we are ready to move forward.

What I need from you is the lead name on the action, the formal title of the action and whether it is a rulemaking, guidance, regulation, etc.

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Thanks!

Toni Colón
OAQPS Tribal Consultation Advisor (TCA)
Community & Tribal Programs Group,
Office of Air Quality Planning & Standards,
Office of Air & Radiation,
U.S. Environmental Protection Agency
Tel: (919) 541-0069/**Fax:** (919) 541-0942
OAR Tribal Air Website
Alone we can do so little; together we can do so much. —Helen Keller

EPA-3256

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Ute Mt Ute Consultation Letter.msg

- Ute Mt Ute Consultation Letter.msg

From: Rosnick, Reid
Sent: Wednesday, April 09, 2014 10:46 AM
To: Peake, Tom
Cc: Perrin, Alan; Edwards, Jonathan
Subject: Ute Mt. Ute Consultation Letter

In anticipation of the FR notice of the Subpart W proposal I drafted a letter to the Chairman of the Ute Mt. Ute requesting consultation. I used a template from the Tribal Handbook, but any comments you have would be appreciated. I assume that once the proposal is published we will have a short window to get this out. Thanks.

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Manuel Heart, Chairman
Ute Mountain Ute Tribe
P.O. Box 6
Towaoc, CO 81334

Dear Chairman Heart:

On ***DATE*** the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. The purpose of this letter is to invite you to consult.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - Conventional tailings impoundments.
    - Evaporation ponds or other nonconventional impoundments at uranium recovery facilities.
    - Heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about ***DATE***. If you wish to initiate government to government consultations with the EPA on this rule, please contact __________------. Please contact us by______in order to request consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Tribal Environmental Director
Tribal Environmental Staff

EPA-2902

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\April 3 meeting conflict.msg

- April 3 meeting conflict.msg

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Tuesday, April 01, 2014 4:19 PM
To: Amy Snyder; Rosnick, Reid
Subject: April 3 meeting conflict

Hello Amy and Reid,

I wanted you to be aware that you have both scheduled meetings on April 3 that involve the uranium crowd. EPA is having its regular quarterly stakeholders call for the Subpart W Rulemaking and NRC is having its annual uranium recovery review.

I imagine that I'm not the only one who would normally participate in both of these meetings. Perhaps one of you would consider rescheduling.

Cheers,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

EPA-3071

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE April 3 meeting conflict.msg

- RE April 3 meeting conflict.msg

From: Rosnick, Reid
Sent: Wednesday, April 02, 2014 10:38 AM
To: Jennifer Thurston
Subject: RE: April 3 meeting conflict

Hi Jennifer,

I regret that there is an overlap between the two meetings. I am reluctant to switch time for the Subpart W call because of my experience at the end of the government shutdown and because we are on a schedule agreed to in a consent agreement. As always, I'll post the minutes as soon as I can, and if you have any questions or comments, please don't hesitate to contact me. Thanks

Reid

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Tuesday, April 01, 2014 4:19 PM
To: Amy Snyder; Rosnick, Reid
Subject: April 3 meeting conflict

Hello Amy and Reid,

I wanted you to be aware that you have both scheduled meetings on April 3 that involve the uranium crowd. EPA is having its regular quarterly stakeholders call for the Subpart W Rulemaking and NRC is having its annual uranium recovery review.

I imagine that I'm not the only one who would normally participate in both of these meetings. Perhaps one of you would consider rescheduling.

Cheers,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

EPA-3175

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE SAN 5281 - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review (OA)(NPRM)(OAR-14-000-6973) (5).msg

- RE SAN 5281 - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review (OA)(NPRM)(OAR-14-000-6973) (5).msg

From: Wang, Weber
Sent: Wednesday, March 26, 2014 10:22 AM
To: Morgan, Ruthw; Knapp, Kristien
Cc: Shaw, Betsy; Powers, Tom; Goffman, Joseph; Eagles, Tom; Mcquilkin, Wendy; Stewart, Lori; Lee, Raymond; Edwards, Jonathan; Millett, John; Drinkard, Andrea; McMichael, Nate; Dennis, Allison; Yeung, Wing; Pritchard, Eileen; Owens, Nicole; Adams, Darryl; Muellerleile, Caryn; Jutras, Nathaniel; Hoag, Paula; Brown, Stephanie N.; Free, Laura; Morris, Stephanie; Brooks, Patricia; Hamilton, Sabrina; Faulkner, Martha; Hammond, Gloria; Geller, Michael; Rosnick, Reid
Subject: RE: SAN 5281 - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review (OA)(NPRM)(OAR-14-000-6973)

Good morning,

The OAR IO concurs. Kristien will forward the edited versions when she returns.

Cordially,
Weber Wang
Special Assistant to the Assistant Administrator
Office of Air and Radiation
U.S. Environmental Protection Agency
Tel: 202-566-0766
wang.weber@epa.gov

From: Morgan, Ruthw
Sent: Thursday, March 20, 2014 12:25 PM
To: Knapp, Kristien; Wang, Weber
Cc: Shaw, Betsy; Powers, Tom; Goffman, Joseph; Eagles, Tom; Mcquilkin, Wendy; Morgan, Ruthw; Stewart, Lori; Lee, Raymond; Edwards, Jonathan; Millett, John; Drinkard, Andrea; McMichael, Nate; Dennis, Allison; Yeung, Wing; Pritchard, Eileen; Owens, Nicole; Adams, Darryl; Muellerleile, Caryn; Jutras, Nathaniel; Hoag, Paula; Brown, Stephanie N.; Free, Laura; Morris, Stephanie; Brooks, Patricia; Hamilton, Sabrina; Faulkner, Martha; Hammond, Gloria; Geller, Michael; Rosnick, Reid
Subject: SAN 5281 - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review (OA)(NPRM)(OAR-14-000-6973)

To OAR Special Assistant for review and concurrence on Administrator's signature package.

03/20/2014 10:17 AM	**SAN: 5281**	**Tier: 2**	**CMS Control #: OAR-14-000-6973**

NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review

Reviewers	Sign Off	Concur	Concur w/ Comment	Non-Concur	Date
OPAR					
Special Assistant					
Lori Stewart					
Janet G. McCabe					

Stage: NPRM for Administrator's Signature

Deadline:

OMB cleared this action on January 13, 2014.

ORIA Contact: Reid Rosnick,- 202 343-9563

ORIA Mgmt. Level Reviewer: Raymond Lee - 202 343-9663

OPAR Contact:

Return to: Ruth Morgan
564-1326, 6358 AR North

EPA-3176

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re SAN 5281 - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review (OA)(NPRM)(OAR-14-000-6973).msg

- Re SAN 5281 - NESHAP Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review (OA)(NPRM)(OAR-14-000-6973).msg

From: Stewart, Lori
Sent: Wednesday, March 26, 2014 10:30 AM
To: Wang, Weber; Morgan, Ruthw; Knapp, Kristien
Cc: Shaw, Betsy; Powers, Tom; Goffman, Joseph; Eagles, Tom; Mcquilkin, Wendy; Lee, Raymond; Edwards, Jonathan; Millett, John; Drinkard, Andrea; McMichael, Nate; Dennis, Allison; Yeung, Wing; Pritchard, Eileen; Owens, Nicole; Adams, Darryl; Muellerleile, Caryn; Jutras, Nathaniel; Hoag, Paula; Brown, Stephanie N.; Free, Laura; Morris, Stephanie; Brooks, Patricia; Hamilton, Sabrina; Faulkner, Martha; Hammond, Gloria; Geller, Michael; Rosnick, Reid
Subject: Re: SAN 5281 - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review (OA)(NPRM)(OAR-14-000-6973)

Just want to note that only the transmittal memo was edited so the rule files are up to date.

From: Wang, Weber
Sent: Wednesday, March 26, 2014 2:22:11 PM
To: Morgan, Ruthw; Knapp, Kristien
Cc: Shaw, Betsy; Powers, Tom; Goffman, Joseph; Eagles, Tom; Mcquilkin, Wendy; Stewart, Lori; Lee, Raymond; Edwards, Jonathan; Millett, John; Drinkard, Andrea; McMichael, Nate; Dennis, Allison; Yeung, Wing; Pritchard, Eileen; Owens, Nicole; Adams, Darryl; Muellerleile, Caryn; Jutras, Nathaniel; Hoag, Paula; Brown, Stephanie N.; Free, Laura; Morris, Stephanie; Brooks, Patricia; Hamilton, Sabrina; Faulkner, Martha; Hammond, Gloria; Geller, Michael; Rosnick, Reid
Subject: RE: SAN 5281 - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review (OA)(NPRM)(OAR-14-000-6973)

Good morning,

The OAR IO concurs. Kristien will forward the edited versions when she returns.

Cordially,

Weber Wang
Special Assistant to the Assistant Administrator
Office of Air and Radiation
U.S. Environmental Protection Agency
Tel: 202-566-0766
wang.weber@epa.gov

From: Morgan, Ruthw
Sent: Thursday, March 20, 2014 12:25 PM
To: Knapp, Kristien; Wang, Weber
Cc: Shaw, Betsy; Powers, Tom; Goffman, Joseph; Eagles, Tom; Mcquilkin, Wendy; Morgan, Ruthw; Stewart, Lori; Lee, Raymond; Edwards, Jonathan; Millett, John; Drinkard, Andrea; McMichael, Nate; Dennis, Allison; Yeung, Wing; Pritchard, Eileen; Owens, Nicole; Adams, Darryl; Muellerleile, Caryn; Jutras, Nathaniel; Hoag, Paula; Brown, Stephanie N.; Free, Laura; Morris, Stephanie; Brooks, Patricia; Hamilton, Sabrina; Faulkner, Martha; Hammond, Gloria; Geller, Michael; Rosnick, Reid
Subject: SAN 5281 - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review (OA)(NPRM)(OAR-14-000-6973)

To OAR Special Assistant for review and concurrence on Administrator's signature package.

03/20/2014 10:17 AM	**SAN: 5281**	**Tier: 2**	**CMS Control #: OAR-14-000-6973**

NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review

Reviewers	Sign Off	Concur	Concur w/ Comment	Non-Concur	Date
OPAR					
Special Assistant					
Lori Stewart					
Janet G. McCabe					

Stage: NPRM for Administrator's Signature

Deadline:

OMB cleared this action on January 13, 2014.

ORIA Contact: Reid Rosnick,- 202 343-9563

ORIA Mgmt. Level Reviewer: Raymond Lee - 202 343-9663

OPAR Contact:

Return to: Ruth Morgan
564-1326, 6358 AR North

EPA-3210

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Your meeting tomorrow with Ute Mountain Ute Tribe Chairman (13).msg

- Re Your meeting tomorrow with Ute Mountain Ute Tribe Chairman (13).msg

-----Original Message-----
From: Flynn, Mike
Sent: Friday, March 21, 2014 5:38 AM
To: McCabe, Janet; Daly, Carl
Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
Subject: Re: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

Yes, Reid Rosnick, who's our lead on the rule, will be on the phone to support you.

From: McCabe, Janet
Sent: Friday, March 21, 2014 12:38:28 AM
To: Flynn, Mike; Daly, Carl
Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
Subject: RE: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

Thanks, ORIA! Will anyone of you be participating in the discussion tomorrow (by phone)? Some of these issues are new to me and I'd only be able to engage in limited substantive discussion.

From: Flynn, Mike
Sent: Thursday, March 20, 2014 4:33 PM
To: McCabe, Janet; Daly, Carl
Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
Subject: RE: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

Janet,

Attached is a paper for your meeting tomorrow with Chairman Heart of the Ute Mountain Ute Tribe. The Chairman has raised concerns about the White Mesa uranium mill in Utah. We've had two meetings with the tribe - one at HQ and one at the Region – and in both, we have been largely in a listening mode. The RA's meeting was with Council Woman Wahl, Scott Clow (Environmental Director), and Celine Hawkins (Tribal Counsel). Chairman Heart was not in attendance. The meeting was primarily to listen to and discuss the Tribe's concerns. Carl and his folks can fill you in more on the discussion.

The Chairman has made four requests – one for formal consultation on our NESHAP Subpart W rule and the other three dealing with enforcement issues at the White Mesa Mill. Our NESHAP Subpart W proposed rule has cleared OMB and was just sent up for signature. We've done a fair amount of outreach on this rule, including meeting with tribes, but we could offer to do formal consultation. Assuming we proceed to signature, the consultation would occur during the public comment period.

Let me know if you any questions.

Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

From: McCabe, Janet
Sent: Thursday, March 20, 2014 8:52 AM
To: Flynn, Mike; Daly, Carl
Subject: Re: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

C, you please send them to me via email but also to R8 so they can print them out for me? Thanks

---

From: Flynn, Mike
Sent: Thursday, March 20, 2014 6:43:50 AM
To: McCabe, Janet
Subject: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

Janet,
Sorry we didn't get materials to you yesterday before you left – we're working on and will get to you today. I'm pushing my folks to clarify what we might be able to offer to address the Chairman's concerns. More later …

Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

EPA-3211

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Your meeting tomorrow with Ute Mountain Ute Tribe Chairman (14).msg

- RE Your meeting tomorrow with Ute Mountain Ute Tribe Chairman (14).msg

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From: McCabe, Janet
Sent: Friday, March 21, 2014 12:38 AM
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Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
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Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

From: McCabe, Janet

Sent: Thursday, March 20, 2014 8:52 AM
To: Flynn, Mike; Daly, Carl
Subject: Re: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

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Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

EPA-3213

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Your meeting tomorrow with Ute Mountain Ute Tribe Chairman.msg

- Re Your meeting tomorrow with Ute Mountain Ute Tribe Chairman.msg

-----Original Message-----
From: McCabe, Janet
Sent: Friday, March 21, 2014 8:32 AM
To: Flynn, Mike; Daly, Carl
Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
Subject: Re: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

Great, thanks

From: Flynn, Mike
Sent: Friday, March 21, 2014 3:38:14 AM
To: McCabe, Janet; Daly, Carl
Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
Subject: Re: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

Yes, Reid Rosnick, who's our lead on the rule, will be on the phone to support you.

From: McCabe, Janet
Sent: Friday, March 21, 2014 12:38:28 AM
To: Flynn, Mike; Daly, Carl
Cc: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan; Perrin, Alan; Rosnick, Reid
Subject: RE: Your meeting tomorrow with Ute Mountain Ute Tribe Chairman

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Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

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Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

EPA-2978

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW meeting request (2).msg

- FW meeting request (2).msg

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 6:21 AM
To: Stahle, Susan
Subject: FW: meeting request

Hi Sue,

This seemed timely because of our discussion yesterday. I would appreciate your thoughts on who needs to be at this meeting.

Reid

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?

Thx so much!

Arnita

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request

Okay, just got these from the Tribe so attached are two briefing papers.

The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....

Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request

I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request

Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request

Hi, Arnita.

I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

Pending EPA actions are:

approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.

Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN AUTHORIZATION OF NEW SOURCES OF ALTERNATE FEED MATERIAL AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. Under its current Radioactive Materials License, the WMM is licensed to receive and process both ore and alternate feed material from specific, approved CERCLA and FUSRAP sites. The WMM currently processes alternate feed material from approved sites, and the WMM also has two pending requests with the State of Utah to add new alternate feed sources to its Radioactive Materials License. The United States Environmental Protection Agency ("EPA") plays an important role in determining whether a facility like the WMM can continue to process alternate feed material because the EPA is responsible for determining whether the White Mesa Mill meets Section 121(d)(3) of CERCLA and 40 C.F.R. § 300.440 of the National Contingency Plan (also known as the "Off-Site Rule"), which mandates that such material may only be transferred to a facility that is operating in compliance with applicable federal and state law.[1]

There are several serious and ongoing environmental contamination issues at the WMM. First, the WMM has caused groundwater contamination beneath the facility, and the constituents present in the contaminated groundwater indicate containment failure or releases from the facility's legacy tailings impoundments.[2] Second, there is uncontroverted scientific evidence that off-site migration of both uranium and vanadium from the WMM facility operations has caused the contamination of surface water, land, and vegetation (on lands located off the WMM property). Third, the WMM has violated and is currently violating the federal radon emissions standards in 40 C.F.R. Part 61, subpart W: it is in violation of the federal work practice standard that limits uranium mills to only two tailings impoundments in operation at any one time; and between June of 2012 and the end of 2013, Radon-222 emissions from one of the tailings cells at the WMM exceeded the federal numeric emissions standard. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation, three of which were built before 1989.

---

[1] The Off-Site Rule is designed to ensure that wastes from CERCLA response actions are only disposed of in properly controlled and compliant off-site facilities and to avoid having such wastes contribute to present or future environmental problems at those facilities. *See, e.g.*, 58 FR 49200-01 ("The purpose of this off-site regulation is to avoid having CERCLA wastes from CERCLA-authorized or -funded response actions contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound. Congress and EPA have always believed that a CERCLA cleanup should be more than a relocation of environmental problems, and have attempted to ensure the proper treatment and disposal of CERCLA wastes removed from a CERCLA site.").

[2] According to an industry expert retained by the Tribe, the liner systems in Tailings Cells 1, 2, and 3 (the legacy cells built when the WMM opened in the early 1980s) are simply unsuitable for their current use because: (a) the liners did not meet industry standard when they were installed; (b) the PVC geomembrane is not suitable for an acidic environment (and cannot reasonably be expected to have survived more than 30 years in such an application, particularly with the presence of alternate feed material solvents); (c) the industry standard has become considerably more robust since installation because of failures in similar systems; and (d) there is considerable evidence that the liners are already leaking.

The presence of alternate feed material at the WMM exacerbates the existing contamination issues at the WMM. The presence of alternate feed material containing solvents and other chemicals in the legacy tailings impoundments increases the risk of containment failure and groundwater contamination from those impoundments. The presence of alternate feed material at the WMM also increases the complexity of both groundwater monitoring and air monitoring at the facility. Finally, the properties of certain types of alternate feed material (e.g., material containing higher uranium content or material that poses increased risks of exposure through fugitive dust events) increase the risk of environmental contamination and human health impacts from the WMM.

As part of an effort to address the risk of catastrophic contamination from the WMM, the Tribe has exhaustively documented its concerns and provided scientific data and reasonable requests related to the regulation of the WMM to the State of Utah and to the EPA. Despite such efforts, the EPA has continued to make Off-Site Rule Determinations to allow the WMM to receive alternate feed material from CERCLA sites. Given the level of effort that the Tribe has expended to engage the EPA in a discussion about the WMM, the Tribe is disturbed and disappointed to see that, as recently as December of 2013, the EPA has undertaken only a cursory and incomplete[3] analysis of whether the WMM is an acceptable facility to receive CERCLA waste.

The Tribe now requests that the EPA take the following actions to ensure that the Off-Site Rule determinations properly reflect the EPA's trust responsibility to protect UMU Tribal members, lands, water, and other Indian Trust Assets from harm caused by the White Mesa Mill:

- Remove the WMM from any EPA list of sites available to receive alternate feed material from CERCLA cleanup sites (and stop approving any CERCLA remedial action plan or other cleanup plan that relies on costs or other considerations associated with the transport of alternate feed material to the WMM) until the WMM has addressed the existing environmental contamination issues and has concurrently reclaimed its legacy tailings impoundments.
- Undertake much more robust analysis during any future Off-Site Rule determinations for the WMM (including, but not limited to, analysis of compliance involving all regulatory agencies or divisions with responsibilities and authorities over the facility).

[3]For example, during a recent Off-Site Rule determination, the EPA only received input from the Utah Division of Radiation Control, and not the Utah Division of Air Quality (the agency responsible for administering the Clean Air Act (and the recent Radon-222 violation)).

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN NESHAPS VIOLATIONS AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. The WMM is subject to and in violation of the National Emission Standards for Radon Emissions from Operating Mill Tailings promulgated as a National Emission Standard for Hazardous Air Pollutants under the federal Clean Air Act and published in 40 C.F.R. Part 61, subpart W ("Subpart W NESHAP"). The Subpart W NESHAP imposes both a Radon-222 air emission standard on the tailings impoundments at the WMM and work practice standards for design, construction and operation of tailings impoundments that limit a uranium mill to only two tailings impoundments in operation at any one time. In designing these standards, EPA intended to limit radon emissions, ensure timely and efficient reclamation of impoundments, and avoid increased pollution of ground and surface waters. While the Utah Division of Air Quality ("UDAQ") has authority to enforce the Subpart W NESHAP through air quality permits, the United States Environmental Protection Agency ("EPA") has federal authority and responsibilities to enforce the Subpart W NESHAP at the WMM.

The WMM has violated and is currently violating the work practice standard by operating more than two tailings impoundments. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation within the meaning of the NESHAP work practice standard,[1] and the reclamation plan for the facility does not require the facility owners to place permanent radon barriers (or final caps to simultaneously address radon emissions and groundwater contamination) until final closure and reclamation of the facility. The EPA agrees that the WMM is currently violating the Subpart W NESHAP work practice standard, but has not taken enforcement action because some of the impoundments are covered in water. The Tribe is very concerned that the lack of enforcement by either the UDAQ or the EPA presents a heightened long-term risk of exposure to radon for the Ute Mountain Ute Tribal members living in the White Mesa Community. The Tribe has repeatedly documented its concerns regarding the work practice standard violation to the State of Utah and the EPA. The Tribe is not alone in its concerns. By letter dated January 29, 2014, the Grand Canyon Trust gave notice of its intent to bring a citizen suit under the Clean Air Act against Energy Fuels Incorporated for the past and ongoing violations of the numeric radon emission and radon work practice standards of the Subpart W NESHAP at the White Mesa Mill.

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[1] The WMM has at least five impoundments that are currently licensed to receive 11(e)(2) byproduct material, all five have been used for disposal of 11(e)(2) byproduct material, all five are currently being used for disposal of 11(e)(2) byproduct material or are in standby status, and none are in final closure. *See* 40 C.F.R. § 61.252. WMM's Utah Groundwater Protection Discharge Permit also authorizes disposal of 11(e)(2) byproduct material (wastes produced from the processing of uranium ore primarily for its source material content) in all five impoundments.

In the spring of 2013, the Tribe discovered that, in June of 2012, Radon-222 emissions from one of the tailings impoundments at the WMM exceeded the federal emissions standard (with average levels 21.5 percent higher than the regulatory emissions limit and with emissions in certain areas of the impoundment more than 40 times the emissions goal set by the WMM's worker safety program). This emissions violation occurred during the de-watering process on the tailings impoundment, even though a consultant for the WMM owner documented that the violation could be permanently eliminated if the WMM owner placed a two-foot random fill (dirt) cover on the tailings impoundment. In late 2013, after almost two years of exposing the Tribal community in White Mesa to illegal levels of Radon-222, the WMM owner was able to bring the facility back under the federal Radon-222 emissions standard. However, because the WMM owner still has not placed even the recommended two-foot random fill cover on the tailings impoundment, and because the de-watering process will continue on that tailings impoundment, the Tribe anticipates that there will be future Radon-222 exceedances in the near future (and as the WMM de-waters the legacy tailings impoundments).

The 2012-2013 Radon-222 exceedance (and lack of appropriate regulatory responses from the UDAQ and the EPA) confirms the Tribe's long-term concerns about Tribal member exposure to radon during the life of the facility. If the WMM continues to operate in violation of the work practice standard and continues to perform tailings impoundment dewatering without more aggressive regulation by the State of Utah and the EPA, the Tribe can expect a high risk of long-term radon exposure to its community in White Mesa. The Tribe is very concerned about the acute human health risk presented by the ongoing and anticipated future radon emissions violations at the WMM.

The Tribe requests the EPA take the following action to ensure the EPA is meeting its regulatory and trust responsibilities to protect UMU Tribal members from harm caused by the WMM:

- Immediately consult with the Tribe about the proposed Subpart W NESHAP rulemaking. Because the UDAQ has indicated that the proposed Subpart W NESHAP rulemaking will address the work practice standard violation at the WMM, and because the Tribe is concerned that the UDAQ and the EPA may be attempting to continue to allow the violation to occur so long as there is water in some of the WMM tailings impoundments, the Tribe insists that the EPA conduct consultation with the Tribe early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.
- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

EPA-2984

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW meeting request.msg

- FW meeting request.msg

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Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

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202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

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There are several serious and ongoing environmental contamination issues at the WMM. First, the WMM has caused groundwater contamination beneath the facility, and the constituents present in the contaminated groundwater indicate containment failure or releases from the facility's legacy tailings impoundments.[2] Second, there is uncontroverted scientific evidence that off-site migration of both uranium and vanadium from the WMM facility operations has caused the contamination of surface water, land, and vegetation (on lands located off the WMM property). Third, the WMM has violated and is currently violating the federal radon emissions standards in 40 C.F.R. Part 61, subpart W: it is in violation of the federal work practice standard that limits uranium mills to only two tailings impoundments in operation at any one time; and between June of 2012 and the end of 2013, Radon-222 emissions from one of the tailings cells at the WMM exceeded the federal numeric emissions standard. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation, three of which were built before 1989.

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[2] According to an industry expert retained by the Tribe, the liner systems in Tailings Cells 1, 2, and 3 (the legacy cells built when the WMM opened in the early 1980s) are simply unsuitable for their current use because: (a) the liners did not meet industry standard when they were installed; (b) the PVC geomembrane is not suitable for an acidic environment (and cannot reasonably be expected to have survived more than 30 years in such an application, particularly with the presence of alternate feed material solvents); (c) the industry standard has become considerably more robust since installation because of failures in similar systems; and (d) there is considerable evidence that the liners are already leaking.

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The WMM has violated and is currently violating the work practice standard by operating more than two tailings impoundments. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation within the meaning of the NESHAP work practice standard,[1] and the reclamation plan for the facility does not require the facility owners to place permanent radon barriers (or final caps to simultaneously address radon emissions and groundwater contamination) until final closure and reclamation of the facility. The EPA agrees that the WMM is currently violating the Subpart W NESHAP work practice standard, but has not taken enforcement action because some of the impoundments are covered in water. The Tribe is very concerned that the lack of enforcement by either the UDAQ or the EPA presents a heightened long-term risk of exposure to radon for the Ute Mountain Ute Tribal members living in the White Mesa Community. The Tribe has repeatedly documented its concerns regarding the work practice standard violation to the State of Utah and the EPA. The Tribe is not alone in its concerns. By letter dated January 29, 2014, the Grand Canyon Trust gave notice of its intent to bring a citizen suit under the Clean Air Act against Energy Fuels Incorporated for the past and ongoing violations of the numeric radon emission and radon work practice standards of the Subpart W NESHAP at the White Mesa Mill.

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The 2012-2013 Radon-222 exceedance (and lack of appropriate regulatory responses from the UDAQ and the EPA) confirms the Tribe's long-term concerns about Tribal member exposure to radon during the life of the facility. If the WMM continues to operate in violation of the work practice standard and continues to perform tailings impoundment dewatering without more aggressive regulation by the State of Utah and the EPA, the Tribe can expect a high risk of long-term radon exposure to its community in White Mesa. The Tribe is very concerned about the acute human health risk presented by the ongoing and anticipated future radon emissions violations at the WMM.

The Tribe requests the EPA take the following action to ensure the EPA is meeting its regulatory and trust responsibilities to protect UMU Tribal members from harm caused by the WMM:

- Immediately consult with the Tribe about the proposed Subpart W NESHAP rulemaking. Because the UDAQ has indicated that the proposed Subpart W NESHAP rulemaking will address the work practice standard violation at the WMM, and because the Tribe is concerned that the UDAQ and the EPA may be attempting to continue to allow the violation to occur so long as there is water in some of the WMM tailings impoundments, the Tribe insists that the EPA conduct consultation with the Tribe early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.
- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

EPA-2979

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW meeting request (3).msg

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From: Rosnick, Reid
Sent: Thursday, March 06, 2014 7:46 AM
To: Schultheisz, Daniel
Subject: FW: meeting request

Dan,

I have Andrea involved in this too. We need to talk.

Reid

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 6:21 AM
To: Stahle, Susan
Subject: FW: meeting request

Hi Sue,

This seemed timely because of our discussion yesterday. I would appreciate your thoughts on who needs to be at this meeting.

Reid

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
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- Immediately consult with the Tribe about the proposed Subpart W NESHAP rulemaking. Because the UDAQ has indicated that the proposed Subpart W NESHAP rulemaking will address the work practice standard violation at the WMM, and because the Tribe is concerned that the UDAQ and the EPA may be attempting to continue to allow the violation to occur so long as there is water in some of the WMM tailings impoundments, the Tribe insists that the EPA conduct consultation with the Tribe early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.
- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

EPA-2980

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW meeting request (4).msg

- FW meeting request (4).msg

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 7:50 AM
To: Angelique Diaz
Subject: FW: meeting request
Importance: High

Hi Angelique,

This is what I was talking about in my vmail.

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

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Thx so much!

Arnita

M. Arnita Hannon
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Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
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ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN AUTHORIZATION OF NEW SOURCES OF ALTERNATE FEED MATERIAL AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. Under its current Radioactive Materials License, the WMM is licensed to receive and process both ore and alternate feed material from specific, approved CERCLA and FUSRAP sites. The WMM currently processes alternate feed material from approved sites, and the WMM also has two pending requests with the State of Utah to add new alternate feed sources to its Radioactive Materials License. The United States Environmental Protection Agency ("EPA") plays an important role in determining whether a facility like the WMM can continue to process alternate feed material because the EPA is responsible for determining whether the White Mesa Mill meets Section 121(d)(3) of CERCLA and 40 C.F.R. § 300.440 of the National Contingency Plan (also known as the "Off-Site Rule"), which mandates that such material may only be transferred to a facility that is operating in compliance with applicable federal and state law.[1]

There are several serious and ongoing environmental contamination issues at the WMM. First, the WMM has caused groundwater contamination beneath the facility, and the constituents present in the contaminated groundwater indicate containment failure or releases from the facility's legacy tailings impoundments.[2] Second, there is uncontroverted scientific evidence that off-site migration of both uranium and vanadium from the WMM facility operations has caused the contamination of surface water, land, and vegetation (on lands located off the WMM property). Third, the WMM has violated and is currently violating the federal radon emissions standards in 40 C.F.R. Part 61, subpart W: it is in violation of the federal work practice standard that limits uranium mills to only two tailings impoundments in operation at any one time; and between June of 2012 and the end of 2013, Radon-222 emissions from one of the tailings cells at the WMM exceeded the federal numeric emissions standard. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation, three of which were built before 1989.

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[1] The Off-Site Rule is designed to ensure that wastes from CERCLA response actions are only disposed of in properly controlled and compliant off-site facilities and to avoid having such wastes contribute to present or future environmental problems at those facilities. *See, e.g.*, 58 FR 49200-01 ("The purpose of this off-site regulation is to avoid having CERCLA wastes from CERCLA-authorized or -funded response actions contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound. Congress and EPA have always believed that a CERCLA cleanup should be more than a relocation of environmental problems, and have attempted to ensure the proper treatment and disposal of CERCLA wastes removed from a CERCLA site.").

[2] According to an industry expert retained by the Tribe, the liner systems in Tailings Cells 1, 2, and 3 (the legacy cells built when the WMM opened in the early 1980s) are simply unsuitable for their current use because: (a) the liners did not meet industry standard when they were installed; (b) the PVC geomembrane is not suitable for an acidic environment (and cannot reasonably be expected to have survived more than 30 years in such an application, particularly with the presence of alternate feed material solvents); (c) the industry standard has become considerably more robust since installation because of failures in similar systems; and (d) there is considerable evidence that the liners are already leaking.

The presence of alternate feed material at the WMM exacerbates the existing contamination issues at the WMM. The presence of alternate feed material containing solvents and other chemicals in the legacy tailings impoundments increases the risk of containment failure and groundwater contamination from those impoundments. The presence of alternate feed material at the WMM also increases the complexity of both groundwater monitoring and air monitoring at the facility. Finally, the properties of certain types of alternate feed material (e.g., material containing higher uranium content or material that poses increased risks of exposure through fugitive dust events) increase the risk of environmental contamination and human health impacts from the WMM.

As part of an effort to address the risk of catastrophic contamination from the WMM, the Tribe has exhaustively documented its concerns and provided scientific data and reasonable requests related to the regulation of the WMM to the State of Utah and to the EPA. Despite such efforts, the EPA has continued to make Off-Site Rule Determinations to allow the WMM to receive alternate feed material from CERCLA sites. Given the level of effort that the Tribe has expended to engage the EPA in a discussion about the WMM, the Tribe is disturbed and disappointed to see that, as recently as December of 2013, the EPA has undertaken only a cursory and incomplete[3] analysis of whether the WMM is an acceptable facility to receive CERCLA waste.

The Tribe now requests that the EPA take the following actions to ensure that the Off-Site Rule determinations properly reflect the EPA's trust responsibility to protect UMU Tribal members, lands, water, and other Indian Trust Assets from harm caused by the White Mesa Mill:

- Remove the WMM from any EPA list of sites available to receive alternate feed material from CERCLA cleanup sites (and stop approving any CERCLA remedial action plan or other cleanup plan that relies on costs or other considerations associated with the transport of alternate feed material to the WMM) until the WMM has addressed the existing environmental contamination issues and has concurrently reclaimed its legacy tailings impoundments.
- Undertake much more robust analysis during any future Off-Site Rule determinations for the WMM (including, but not limited to, analysis of compliance involving all regulatory agencies or divisions with responsibilities and authorities over the facility).

[3]For example, during a recent Off-Site Rule determination, the EPA only received input from the Utah Division of Radiation Control, and not the Utah Division of Air Quality (the agency responsible for administering the Clean Air Act (and the recent Radon-222 violation)).

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN NESHAPS VIOLATIONS AT THE WHITE MESA MILL, UTAH

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The WMM has violated and is currently violating the work practice standard by operating more than two tailings impoundments. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation within the meaning of the NESHAP work practice standard,[1] and the reclamation plan for the facility does not require the facility owners to place permanent radon barriers (or final caps to simultaneously address radon emissions and groundwater contamination) until final closure and reclamation of the facility. The EPA agrees that the WMM is currently violating the Subpart W NESHAP work practice standard, but has not taken enforcement action because some of the impoundments are covered in water. The Tribe is very concerned that the lack of enforcement by either the UDAQ or the EPA presents a heightened long-term risk of exposure to radon for the Ute Mountain Ute Tribal members living in the White Mesa Community. The Tribe has repeatedly documented its concerns regarding the work practice standard violation to the State of Utah and the EPA. The Tribe is not alone in its concerns. By letter dated January 29, 2014, the Grand Canyon Trust gave notice of its intent to bring a citizen suit under the Clean Air Act against Energy Fuels Incorporated for the past and ongoing violations of the numeric radon emission and radon work practice standards of the Subpart W NESHAP at the White Mesa Mill.

[1] The WMM has at least five impoundments that are currently licensed to receive 11(e)(2) byproduct material, all five have been used for disposal of 11(e)(2) byproduct material, all five are currently being used for disposal of 11(e)(2) byproduct material or are in standby status, and none are in final closure. *See* 40 C.F.R. § 61.252. WMM's Utah Groundwater Protection Discharge Permit also authorizes disposal of 11(e)(2) byproduct material (wastes produced from the processing of uranium ore primarily for its source material content) in all five impoundments.

In the spring of 2013, the Tribe discovered that, in June of 2012, Radon-222 emissions from one of the tailings impoundments at the WMM exceeded the federal emissions standard (with average levels 21.5 percent higher than the regulatory emissions limit and with emissions in certain areas of the impoundment more than 40 times the emissions goal set by the WMM's worker safety program). This emissions violation occurred during the de-watering process on the tailings impoundment, even though a consultant for the WMM owner documented that the violation could be permanently eliminated if the WMM owner placed a two-foot random fill (dirt) cover on the tailings impoundment. In late 2013, after almost two years of exposing the Tribal community in White Mesa to illegal levels of Radon-222, the WMM owner was able to bring the facility back under the federal Radon-222 emissions standard. However, because the WMM owner still has not placed even the recommended two-foot random fill cover on the tailings impoundment, and because the de-watering process will continue on that tailings impoundment, the Tribe anticipates that there will be future Radon-222 exceedances in the near future (and as the WMM de-waters the legacy tailings impoundments).

The 2012-2013 Radon-222 exceedance (and lack of appropriate regulatory responses from the UDAQ and the EPA) confirms the Tribe's long-term concerns about Tribal member exposure to radon during the life of the facility. If the WMM continues to operate in violation of the work practice standard and continues to perform tailings impoundment dewatering without more aggressive regulation by the State of Utah and the EPA, the Tribe can expect a high risk of long-term radon exposure to its community in White Mesa. The Tribe is very concerned about the acute human health risk presented by the ongoing and anticipated future radon emissions violations at the WMM.

The Tribe requests the EPA take the following action to ensure the EPA is meeting its regulatory and trust responsibilities to protect UMU Tribal members from harm caused by the WMM:

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- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

EPA-3119

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE meeting request.msg

- RE meeting request.msg

From: Cherepy, Andrea
Sent: Thursday, March 06, 2014 7:58 AM
To: Rosnick, Reid
Cc: Schultheisz, Daniel
Subject: RE: meeting request

Reid,
Since the tribe is officially requesting tribal consultation on Subpart W this meeting should be considered part of a consultation. You will want to write up a "Note to File" after the meeting to document that it happened and to capture in writing what was discussed. Also, since a tribal government official will be present, you will want someone from the management team there... though this may not be as important since it looks like OITA is taking the lead in this meeting. You will probably want Tom and Jon or Alan present at any follow-up consultation meetings with tribal government officials.
It sounds like this tribe might have experience with tribal consultations at EPA and may have expectations going in. We could contact Laura McKelvey in OAQPS to see if she has dealt with this tribe in the past. It's my understanding that Laura has the most consultation experience in OAR. She helped draft the policy/guidance.
Feel free to call if you want to discuss further. I'm teleworking today and can be reached at (202) 570-2393.
Thank you,
Andrea

From: Rosnick, Reid
Sent: Thursday, March 6, 2014 6:18 AM
To: Cherepy, Andrea
Cc: Schultheisz, Daniel
Subject: FW: meeting request
Hi Andrea,
Could you please help me determine who should meet with the Ute Mountain Ute Tribal Chief when he visits here next week? Also, would this qualify as a "consultation." Thanks, I'm in the office today, 202-343-9563.
Reid
From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
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Thx so much!

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EPA-2981

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW meeting request (9).msg

- FW meeting request (9).msg

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 1:43 PM
To: Edwards, Jonathan; Perrin, Alan; Schultheisz, Daniel
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FYI, You had asked for the name of the person in OCIR . Still haven't heard back from her.

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ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN AUTHORIZATION OF NEW SOURCES OF ALTERNATE FEED MATERIAL AT THE WHITE MESA MILL, UTAH

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There are several serious and ongoing environmental contamination issues at the WMM. First, the WMM has caused groundwater contamination beneath the facility, and the constituents present in the contaminated groundwater indicate containment failure or releases from the facility's legacy tailings impoundments.[2] Second, there is uncontroverted scientific evidence that off-site migration of both uranium and vanadium from the WMM facility operations has caused the contamination of surface water, land, and vegetation (on lands located off the WMM property). Third, the WMM has violated and is currently violating the federal radon emissions standards in 40 C.F.R. Part 61, subpart W: it is in violation of the federal work practice standard that limits uranium mills to only two tailings impoundments in operation at any one time; and between June of 2012 and the end of 2013, Radon-222 emissions from one of the tailings cells at the WMM exceeded the federal numeric emissions standard. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation, three of which were built before 1989.

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[1] The Off-Site Rule is designed to ensure that wastes from CERCLA response actions are only disposed of in properly controlled and compliant off-site facilities and to avoid having such wastes contribute to present or future environmental problems at those facilities. *See, e.g.*, 58 FR 49200-01 ("The purpose of this off-site regulation is to avoid having CERCLA wastes from CERCLA-authorized or -funded response actions contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound. Congress and EPA have always believed that a CERCLA cleanup should be more than a relocation of environmental problems, and have attempted to ensure the proper treatment and disposal of CERCLA wastes removed from a CERCLA site.").

[2] According to an industry expert retained by the Tribe, the liner systems in Tailings Cells 1, 2, and 3 (the legacy cells built when the WMM opened in the early 1980s) are simply unsuitable for their current use because: (a) the liners did not meet industry standard when they were installed; (b) the PVC geomembrane is not suitable for an acidic environment (and cannot reasonably be expected to have survived more than 30 years in such an application, particularly with the presence of alternate feed material solvents); (c) the industry standard has become considerably more robust since installation because of failures in similar systems; and (d) there is considerable evidence that the liners are already leaking.

The presence of alternate feed material at the WMM exacerbates the existing contamination issues at the WMM. The presence of alternate feed material containing solvents and other chemicals in the legacy tailings impoundments increases the risk of containment failure and groundwater contamination from those impoundments. The presence of alternate feed material at the WMM also increases the complexity of both groundwater monitoring and air monitoring at the facility. Finally, the properties of certain types of alternate feed material (e.g., material containing higher uranium content or material that poses increased risks of exposure through fugitive dust events) increase the risk of environmental contamination and human health impacts from the WMM.

As part of an effort to address the risk of catastrophic contamination from the WMM, the Tribe has exhaustively documented its concerns and provided scientific data and reasonable requests related to the regulation of the WMM to the State of Utah and to the EPA. Despite such efforts, the EPA has continued to make Off-Site Rule Determinations to allow the WMM to receive alternate feed material from CERCLA sites. Given the level of effort that the Tribe has expended to engage the EPA in a discussion about the WMM, the Tribe is disturbed and disappointed to see that, as recently as December of 2013, the EPA has undertaken only a cursory and incomplete[3] analysis of whether the WMM is an acceptable facility to receive CERCLA waste.

The Tribe now requests that the EPA take the following actions to ensure that the Off-Site Rule determinations properly reflect the EPA's trust responsibility to protect UMU Tribal members, lands, water, and other Indian Trust Assets from harm caused by the White Mesa Mill:

- Remove the WMM from any EPA list of sites available to receive alternate feed material from CERCLA cleanup sites (and stop approving any CERCLA remedial action plan or other cleanup plan that relies on costs or other considerations associated with the transport of alternate feed material to the WMM) until the WMM has addressed the existing environmental contamination issues and has concurrently reclaimed its legacy tailings impoundments.
- Undertake much more robust analysis during any future Off-Site Rule determinations for the WMM (including, but not limited to, analysis of compliance involving all regulatory agencies or divisions with responsibilities and authorities over the facility).

[3]For example, during a recent Off-Site Rule determination, the EPA only received input from the Utah Division of Radiation Control, and not the Utah Division of Air Quality (the agency responsible for administering the Clean Air Act (and the recent Radon-222 violation)).

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN NESHAPS VIOLATIONS AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. The WMM is subject to and in violation of the National Emission Standards for Radon Emissions from Operating Mill Tailings promulgated as a National Emission Standard for Hazardous Air Pollutants under the federal Clean Air Act and published in 40 C.F.R. Part 61, subpart W ("Subpart W NESHAP"). The Subpart W NESHAP imposes both a Radon-222 air emission standard on the tailings impoundments at the WMM and work practice standards for design, construction and operation of tailings impoundments that limit a uranium mill to only two tailings impoundments in operation at any one time. In designing these standards, EPA intended to limit radon emissions, ensure timely and efficient reclamation of impoundments, and avoid increased pollution of ground and surface waters. While the Utah Division of Air Quality ("UDAQ") has authority to enforce the Subpart W NESHAP through air quality permits, the United States Environmental Protection Agency ("EPA") has federal authority and responsibilities to enforce the Subpart W NESHAP at the WMM.

The WMM has violated and is currently violating the work practice standard by operating more than two tailings impoundments. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation within the meaning of the NESHAP work practice standard,[1] and the reclamation plan for the facility does not require the facility owners to place permanent radon barriers (or final caps to simultaneously address radon emissions and groundwater contamination) until final closure and reclamation of the facility. The EPA agrees that the WMM is currently violating the Subpart W NESHAP work practice standard, but has not taken enforcement action because some of the impoundments are covered in water. The Tribe is very concerned that the lack of enforcement by either the UDAQ or the EPA presents a heightened long-term risk of exposure to radon for the Ute Mountain Ute Tribal members living in the White Mesa Community. The Tribe has repeatedly documented its concerns regarding the work practice standard violation to the State of Utah and the EPA. The Tribe is not alone in its concerns. By letter dated January 29, 2014, the Grand Canyon Trust gave notice of its intent to bring a citizen suit under the Clean Air Act against Energy Fuels Incorporated for the past and ongoing violations of the numeric radon emission and radon work practice standards of the Subpart W NESHAP at the White Mesa Mill.

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[1] The WMM has at least five impoundments that are currently licensed to receive 11(e)(2) byproduct material, all five have been used for disposal of 11(e)(2) byproduct material, all five are currently being used for disposal of 11(e)(2) byproduct material or are in standby status, and none are in final closure. *See* 40 C.F.R. § 61.252. WMM's Utah Groundwater Protection Discharge Permit also authorizes disposal of 11(e)(2) byproduct material (wastes produced from the processing of uranium ore primarily for its source material content) in all five impoundments.

In the spring of 2013, the Tribe discovered that, in June of 2012, Radon-222 emissions from one of the tailings impoundments at the WMM exceeded the federal emissions standard (with average levels 21.5 percent higher than the regulatory emissions limit and with emissions in certain areas of the impoundment more than 40 times the emissions goal set by the WMM's worker safety program). This emissions violation occurred during the de-watering process on the tailings impoundment, even though a consultant for the WMM owner documented that the violation could be permanently eliminated if the WMM owner placed a two-foot random fill (dirt) cover on the tailings impoundment. In late 2013, after almost two years of exposing the Tribal community in White Mesa to illegal levels of Radon-222, the WMM owner was able to bring the facility back under the federal Radon-222 emissions standard. However, because the WMM owner still has not placed even the recommended two-foot random fill cover on the tailings impoundment, and because the de-watering process will continue on that tailings impoundment, the Tribe anticipates that there will be future Radon-222 exceedances in the near future (and as the WMM de-waters the legacy tailings impoundments).

The 2012-2013 Radon-222 exceedance (and lack of appropriate regulatory responses from the UDAQ and the EPA) confirms the Tribe's long-term concerns about Tribal member exposure to radon during the life of the facility. If the WMM continues to operate in violation of the work practice standard and continues to perform tailings impoundment dewatering without more aggressive regulation by the State of Utah and the EPA, the Tribe can expect a high risk of long-term radon exposure to its community in White Mesa. The Tribe is very concerned about the acute human health risk presented by the ongoing and anticipated future radon emissions violations at the WMM.

The Tribe requests the EPA take the following action to ensure the EPA is meeting its regulatory and trust responsibilities to protect UMU Tribal members from harm caused by the WMM:

- Immediately consult with the Tribe about the proposed Subpart W NESHAP rulemaking. Because the UDAQ has indicated that the proposed Subpart W NESHAP rulemaking will address the work practice standard violation at the WMM, and because the Tribe is concerned that the UDAQ and the EPA may be attempting to continue to allow the violation to occur so long as there is water in some of the WMM tailings impoundments, the Tribe insists that the EPA conduct consultation with the Tribe early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.
- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

EPA-3116

Reid Rosnick

To	
cc	
bcc	
Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE meeting request (7).msg

- RE meeting request (7).msg

From: Garlow, Charlie
Sent: Thursday, March 06, 2014 11:28 AM
To: Rochlin, David
Cc: Rosnick, Reid
Subject: RE: meeting request

Reid,
If you want me to attend the DC meeting with the tribes, I would be glad to join you.
Include me in on the e-calendar invite when we decide on a time and place.

Charlie Garlow, Attorney-Advisor
US Environmental Protection Agency
Office of Enforcement and Compliance Assurance
Office of Civil Enforcement - Air Enforcement Division
202-564-1088 phone
202-564-0068 fax
1200 Pennsylvania Ave, NW, MC 2242A
Washington, DC 20460 mail or 20004 courier

"Life's most urgent question is what are you doing to help others?" - - Martin Luther King, Jr.
"Through the centuries, men [and women - ed.] of law have been persistently concerned with the resolution of disputes in ways that enable society to achieve its goals with a minimum of force and maximum of reason." - - Archibald Cox

From: Rochlin, David
Sent: Thursday, March 06, 2014 11:11 AM
To: Garlow, Charlie
Subject: FW: meeting request
Importance: High

More on White Mesa Mill and Ute Mountain Ute Tribe—meeting in D.C.

From: Laumann, Sara
Sent: Thursday, March 06, 2014 9:05 AM
To: Logan, Paul; Chin, Lucita; Rochlin, David; Boydston, Michael
Subject: FW: meeting request
Importance: High

Thought you would be interested to know about this.

From: Diaz, Angelique
Sent: Thursday, March 06, 2014 8:58 AM
To: Palomares, Art; Morlock, Nancy; Brown, Terry; Mitre, Alfreda
Cc: Shanahan, Mike; Daly, Carl; Jackson, Scott; Laumann, Sara; Patefield, Scott; Reynolds, Cynthia
Subject: FW: meeting request
Importance: High

FYI – Ute Mountain Ute Tribal Chairman, Manuel Heart, will be in DC next week (3/13 and 3/14) to discuss EPA's role in alleged Subpart W violations and approval of alternate feed material (see attachments). Not sure yet who Chairman Heart will be meeting with.

This information should be added to the briefing document for Shaun.

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 5:50 AM
To: Diaz, Angelique
Subject: FW: meeting request
Importance: High

Hi Angelique,

This is what I was talking about in my vmail.

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?

Thx so much!

Arnita

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)

202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request

Okay, just got these from the Tribe so attached are two briefing papers.

The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....
Christine Arbogast
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(720) 373-3655

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-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!

M. Arnita Hannon
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From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request

I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>

Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request

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When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

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I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

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approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

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EPA-3117

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE meeting request (8).msg

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From: Rosnick, Reid
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To: Garlow, Charlie
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Reid

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EPA-3031

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Meeting Request Ute Mountain Ute Tribal Chairman Manuel Heart (Thursday March 13 - 2 15 - 2 45 pm - 3528 WJC North.msg

- Meeting Request Ute Mountain Ute Tribal Chairman Manuel Heart (Thursday March 13 - 2 15 - 2 45 pm - 3528 WJC North.msg

From: Hannon, Arnita
Sent: Friday, March 07, 2014 1:30 PM
To: Atkinson, Emily
Cc: Rosnick, Reid; Stewart, Lori; Flynn, Mike; Edwards, Jonathan; Deitz, Randy; Gogal, Danny; Wood, MelanieL; Stahle, Susan; Hannon, Arnita
Subject: Meeting Request: Ute Mountain Ute Tribal Chairman Manuel Heart (Thursday, March 13 - 2:15 - 2:45 pm - 3528 WJC North

Request: Ute Tribal Chairman Manuel Heart (Ute Tribe is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well)
Issue: Uranium Mill in Utah near the tribal community in White Mesa.
Pending EPA actions: (1) approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met; (2) the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

Emily – Might Janet be available to attend all or part of this meeting? We would also invite others copied here from the Office of Radiation and Indoor Air; Environmental Justice; OGC; OSWER. Region VIII staff would participate by telephone and Melanie Wood will gather appropriate regional staff.

Please advise about Janet's availability on Thursday, March 13 and I can get an invite out today if that is ok.

Thx very much and also thanks so much to Reid for talking with me about this!

Arnita

M. Arnita Hannon
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Office of Congressional and Intergovernmental Relations
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1200 Pennsylvania Avenue, NW
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There are several serious and ongoing environmental contamination issues at the WMM. First, the WMM has caused groundwater contamination beneath the facility, and the constituents present in the contaminated groundwater indicate containment failure or releases from the facility's legacy tailings impoundments.[2] Second, there is uncontroverted scientific evidence that off-site migration of both uranium and vanadium from the WMM facility operations has caused the contamination of surface water, land, and vegetation (on lands located off the WMM property). Third, the WMM has violated and is currently violating the federal radon emissions standards in 40 C.F.R. Part 61, subpart W: it is in violation of the federal work practice standard that limits uranium mills to only two tailings impoundments in operation at any one time; and between June of 2012 and the end of 2013, Radon-222 emissions from one of the tailings cells at the WMM exceeded the federal numeric emissions standard. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation, three of which were built before 1989.

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[1] The Off-Site Rule is designed to ensure that wastes from CERCLA response actions are only disposed of in properly controlled and compliant off-site facilities and to avoid having such wastes contribute to present or future environmental problems at those facilities. *See, e.g.*, 58 FR 49200-01 ("The purpose of this off-site regulation is to avoid having CERCLA wastes from CERCLA-authorized or -funded response actions contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound. Congress and EPA have always believed that a CERCLA cleanup should be more than a relocation of environmental problems, and have attempted to ensure the proper treatment and disposal of CERCLA wastes removed from a CERCLA site.").

[2] According to an industry expert retained by the Tribe, the liner systems in Tailings Cells 1, 2, and 3 (the legacy cells built when the WMM opened in the early 1980s) are simply unsuitable for their current use because: (a) the liners did not meet industry standard when they were installed; (b) the PVC geomembrane is not suitable for an acidic environment (and cannot reasonably be expected to have survived more than 30 years in such an application, particularly with the presence of alternate feed material solvents); (c) the industry standard has become considerably more robust since installation because of failures in similar systems; and (d) there is considerable evidence that the liners are already leaking.

The presence of alternate feed material at the WMM exacerbates the existing contamination issues at the WMM. The presence of alternate feed material containing solvents and other chemicals in the legacy tailings impoundments increases the risk of containment failure and groundwater contamination from those impoundments. The presence of alternate feed material at the WMM also increases the complexity of both groundwater monitoring and air monitoring at the facility. Finally, the properties of certain types of alternate feed material (e.g., material containing higher uranium content or material that poses increased risks of exposure through fugitive dust events) increase the risk of environmental contamination and human health impacts from the WMM.

As part of an effort to address the risk of catastrophic contamination from the WMM, the Tribe has exhaustively documented its concerns and provided scientific data and reasonable requests related to the regulation of the WMM to the State of Utah and to the EPA. Despite such efforts, the EPA has continued to make Off-Site Rule Determinations to allow the WMM to receive alternate feed material from CERCLA sites. Given the level of effort that the Tribe has expended to engage the EPA in a discussion about the WMM, the Tribe is disturbed and disappointed to see that, as recently as December of 2013, the EPA has undertaken only a cursory and incomplete[3] analysis of whether the WMM is an acceptable facility to receive CERCLA waste.

The Tribe now requests that the EPA take the following actions to ensure that the Off-Site Rule determinations properly reflect the EPA's trust responsibility to protect UMU Tribal members, lands, water, and other Indian Trust Assets from harm caused by the White Mesa Mill:

- Remove the WMM from any EPA list of sites available to receive alternate feed material from CERCLA cleanup sites (and stop approving any CERCLA remedial action plan or other cleanup plan that relies on costs or other considerations associated with the transport of alternate feed material to the WMM) until the WMM has addressed the existing environmental contamination issues and has concurrently reclaimed its legacy tailings impoundments.
- Undertake much more robust analysis during any future Off-Site Rule determinations for the WMM (including, but not limited to, analysis of compliance involving all regulatory agencies or divisions with responsibilities and authorities over the facility).

[3]For example, during a recent Off-Site Rule determination, the EPA only received input from the Utah Division of Radiation Control, and not the Utah Division of Air Quality (the agency responsible for administering the Clean Air Act (and the recent Radon-222 violation)).

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN NESHAPS VIOLATIONS AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. The WMM is subject to and in violation of the National Emission Standards for Radon Emissions from Operating Mill Tailings promulgated as a National Emission Standard for Hazardous Air Pollutants under the federal Clean Air Act and published in 40 C.F.R. Part 61, subpart W ("Subpart W NESHAP"). The Subpart W NESHAP imposes both a Radon-222 air emission standard on the tailings impoundments at the WMM and work practice standards for design, construction and operation of tailings impoundments that limit a uranium mill to only two tailings impoundments in operation at any one time. In designing these standards, EPA intended to limit radon emissions, ensure timely and efficient reclamation of impoundments, and avoid increased pollution of ground and surface waters. While the Utah Division of Air Quality ("UDAQ") has authority to enforce the Subpart W NESHAP through air quality permits, the United States Environmental Protection Agency ("EPA") has federal authority and responsibilities to enforce the Subpart W NESHAP at the WMM.

The WMM has violated and is currently violating the work practice standard by operating more than two tailings impoundments. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation within the meaning of the NESHAP work practice standard,[1] and the reclamation plan for the facility does not require the facility owners to place permanent radon barriers (or final caps to simultaneously address radon emissions and groundwater contamination) until final closure and reclamation of the facility. The EPA agrees that the WMM is currently violating the Subpart W NESHAP work practice standard, but has not taken enforcement action because some of the impoundments are covered in water. The Tribe is very concerned that the lack of enforcement by either the UDAQ or the EPA presents a heightened long-term risk of exposure to radon for the Ute Mountain Ute Tribal members living in the White Mesa Community. The Tribe has repeatedly documented its concerns regarding the work practice standard violation to the State of Utah and the EPA. The Tribe is not alone in its concerns. By letter dated January 29, 2014, the Grand Canyon Trust gave notice of its intent to bring a citizen suit under the Clean Air Act against Energy Fuels Incorporated for the past and ongoing violations of the numeric radon emission and radon work practice standards of the Subpart W NESHAP at the White Mesa Mill.

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[1] The WMM has at least five impoundments that are currently licensed to receive 11(e)(2) byproduct material, all five have been used for disposal of 11(e)(2) byproduct material, all five are currently being used for disposal of 11(e)(2) byproduct material or are in standby status, and none are in final closure. *See* 40 C.F.R. § 61.252. WMM's Utah Groundwater Protection Discharge Permit also authorizes disposal of 11(e)(2) byproduct material (wastes produced from the processing of uranium ore primarily for its source material content) in all five impoundments.

In the spring of 2013, the Tribe discovered that, in June of 2012, Radon-222 emissions from one of the tailings impoundments at the WMM exceeded the federal emissions standard (with average levels 21.5 percent higher than the regulatory emissions limit and with emissions in certain areas of the impoundment more than 40 times the emissions goal set by the WMM's worker safety program). This emissions violation occurred during the de-watering process on the tailings impoundment, even though a consultant for the WMM owner documented that the violation could be permanently eliminated if the WMM owner placed a two-foot random fill (dirt) cover on the tailings impoundment. In late 2013, after almost two years of exposing the Tribal community in White Mesa to illegal levels of Radon-222, the WMM owner was able to bring the facility back under the federal Radon-222 emissions standard. However, because the WMM owner still has not placed even the recommended two-foot random fill cover on the tailings impoundment, and because the de-watering process will continue on that tailings impoundment, the Tribe anticipates that there will be future Radon-222 exceedances in the near future (and as the WMM de-waters the legacy tailings impoundments).

The 2012-2013 Radon-222 exceedance (and lack of appropriate regulatory responses from the UDAQ and the EPA) confirms the Tribe's long-term concerns about Tribal member exposure to radon during the life of the facility. If the WMM continues to operate in violation of the work practice standard and continues to perform tailings impoundment dewatering without more aggressive regulation by the State of Utah and the EPA, the Tribe can expect a high risk of long-term radon exposure to its community in White Mesa. The Tribe is very concerned about the acute human health risk presented by the ongoing and anticipated future radon emissions violations at the WMM.

The Tribe requests the EPA take the following action to ensure the EPA is meeting its regulatory and trust responsibilities to protect UMU Tribal members from harm caused by the WMM:

- Immediately consult with the Tribe about the proposed Subpart W NESHAP rulemaking. Because the UDAQ has indicated that the proposed Subpart W NESHAP rulemaking will address the work practice standard violation at the WMM, and because the Tribe is concerned that the UDAQ and the EPA may be attempting to continue to allow the violation to occur so long as there is water in some of the WMM tailings impoundments, the Tribe insists that the EPA conduct consultation with the Tribe early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.
- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

EPA-3105

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Meeting request from Chief of Ute Mountain Ute Tribe (13).msg

- RE Meeting request from Chief of Ute Mountain Ute Tribe (13).msg

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 10:08 AM
To: Edwards, Jonathan; Childers, Pat
Cc: Peake, Tom; Rosnick, Reid; Perrin, Alan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Oopss Pat…. Just saw your last set of emails…. So we will "stand down" and let the Thursday meeting be only OSWER and aim to prep Janet for the meeting on the 21st ….

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 10:03 AM
To: Childers, Pat
Cc: Peake, Tom; Rosnick, Reid; Perrin, Alan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Agree Pat--- Tom or Reid you may want to plan to attend Thursday's meeting but in a lower key role because of Janet's planned meeting in Denver. --Jon

From: Childers, Pat
Sent: Monday, March 10, 2014 8:05 AM
To: Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

I agree an OSWER led DC meeting would work. We are offering a reasonable alternative, but if the tribe still wants to meet OSWER can take the lead but OAR may want to be involved but without janet possibly, Mike or Tom Powers could be our rep (I'm on travel) with the understanding of a formal consultation at the later date. Having someone listen in and nod to help inform the later briefing may be useful.

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Sent: Sunday, March 09, 2014 8:36:45 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Pat-- If OCIR still feels like a meeting needs to happen on Thurs because the tribe's Chief is in town they should probably do an OSWER only meeting since there is that separate "alternate feed material" issue that is theirs. Janet would hear the air issues later in Denver as she has expressed... Make sense?

From: Childers, Pat
Sent: Saturday, March 8, 2014 7:29:09 AM
To: Edwards, Jonathan; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

That's what I needed to know thanks Jonathan

From: Edwards, Jonathan
Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Pat--- The meeting request for Thursday has been coming from OCIR -- Anita Hannon. Will you follow-up on this? Thanks--jon

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To: Harrison, Jed; Edwards, Jonathan
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: FW: Meeting request from Chief of Ute Mountain Ute Tribe

Hi Jonathan and Jed

Who has been talking/communicating with the tribe on this issue?

We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all

Pat

From: McCabe, Janet
Sent: Friday, March 07, 2014 3:46 PM
To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

From: Childers, Pat
Sent: Friday, March 07, 2014 2:00:54 PM
To: Flynn, Mike; McCabe, Janet; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks Mike,

I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.

I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.

Pat

From: Flynn, Mike
Sent: Friday, March 07, 2014 1:53 PM
To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe

Janet,
You may have heard this already from Pat, but I wanted to give you a heads that the Chief of the Ute Mountain Ute tribe, located in Colorado, has requested a meeting next week to discuss issues associated with the White Mesa uranium mill, owned by Energy Fuels, Inc. The Tribe is also scheduled to meet with the Region 8 Administrator on March 17, 2014. The mill is located in southeast Utah. In short, the Tribe is alleging that the facility is in violation of our Subpart W rules and EPA's Off-Site rule (under CERCLA), and is concerned that actions are not being taken against the facility.

Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.

They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.

Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

From: Harrison, Jed
Sent: Thursday, March 06, 2014 4:22 PM
To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request

Pat-

Here's the background info on the heads up I gave you. Tribe is Ute Mountain Ute. I misspoke about the request, it came thru OCIR not OITA.

I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief. However I also understand there's a management retreat on the 13^{th}? I'm sure Mike will bring it up with Janet.

Jed

Jed Harrison Senior Advisor For Tribal Affairs
U.S. Environmental Protection Agency
Office of Radiation & Indoor Air
(702) 784 8218 mobile: (702) 494 7050

4220 S. Maryland Parkway
Bldg. D, Suite 800
Las Vegas, Nevada 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM
To: Harrison, Jed
Subject: FW: meeting request

For this afternoon's tribal meeting.

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?

Thx so much!

Arnita

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request

Okay, just got these from the Tribe so attached are two briefing papers.

The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....

Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

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-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!

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From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request

I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request

Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request

Hi, Arnita.

I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

Pending EPA actions are:

approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.

Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
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EPA-3115

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Meeting request from Chief of Ute Mountain Ute Tribe.msg

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Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

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I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

Pending EPA actions are:

approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.

Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

EPA-3012

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Subpart W Note to Janet.msg

- FW Subpart W Note to Janet.msg

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 5:12 PM
To: Flynn, Mike
Cc: Rosnick, Reid; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Subject: FW: Subpart W Note to Janet

Mike--- as you requested. --Jon

From: Rosnick, Reid
Sent: Monday, March 10, 2014 11:26 AM
To: Flynn, Mike
Cc: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Subject: Subpart W Note to Janet

As requested.

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

<u>Note to AA/Janet</u>

Janet,

This package includes a Notice of Proposed Rulemaking that would revise "National Emission Standards for Operating Uranium Mill Tailings," Subpart W of 40 CFR part 61. With this action, the Agency would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities.

The Agency agreed to issue this proposed rulemaking through a settlement agreement with two groups: *Colorado Citizens Against Toxic Waste* and *Rocky Mountain Clean Air Action*. The proposed action will add and refine definitions, as well as confirm its applicability to all facilities that manage uranium byproduct material/tailings, including conventional mills, in-situ leach facilities and heap leach piles. If finalized, the proposed rule would apply to 12 currently operating facilities. We anticipate mixed external reactions. State, local and tribal governments will likely be supportive. We expect industry groups will challenge our determinations on the applicability of Subpart W to evaporation ponds and heap leach piles. *Colorado Citizens Against Toxic Waste* is likely to express frustration that we are proposing a technology-based standard instead of numeric limits.

The notice's publication in the Federal Register begins a 90-day public comment period, and the rule along with additional information will be posted on our website (www.epa.gov/radiation). If you have any questions, please feel free to contact me or Reid Rosnick (202-343-9563), the workgroup chair on this action.

EPA-3106

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Meeting request from Chief of Ute Mountain Ute Tribe (14).msg

- Re Meeting request from Chief of Ute Mountain Ute Tribe (14).msg

From: Childers, Pat
Sent: Monday, March 10, 2014 10:26 AM
To: Edwards, Jonathan
Cc: Peake, Tom; Rosnick, Reid; Perrin, Alan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Either ways fine I just wanted ocir to know it wasn't our (OAR) meeting. Once that's established you all can decide on attending or not to listen in.

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 10:08:01 AM
To: Edwards, Jonathan; Childers, Pat
Cc: Peake, Tom; Rosnick, Reid; Perrin, Alan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Oopss Pat…. Just saw your last set of emails…. So we will "stand down" and let the Thursday meeting be only OSWER and aim to prep Janet for the meeting on the 21st ….
From: Edwards, Jonathan
Sent: Monday, March 10, 2014 10:03 AM
To: Childers, Pat
Cc: Peake, Tom; Rosnick, Reid; Perrin, Alan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Agree Pat--- Tom or Reid you may want to plan to attend Thursday's meeting but in a lower key role because of Janet's planned meeting in Denver. --Jon
From: Childers, Pat
Sent: Monday, March 10, 2014 8:05 AM
To: Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
I agree an OSWER led DC meeting would work. We are offering a reasonable alternative, but if the tribe still wants to meet OSWER can take the lead but OAR may want to be involved but without janet possibly, Mike or Tom Powers could be our rep (I'm on travel) with the understanding of a formal consultation at the later date. Having someone listen in and nod to help inform the later briefing may be useful.

From: Edwards, Jonathan
Sent: Sunday, March 09, 2014 8:36:45 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Pat-- If OCIR still feels like a meeting needs to happen on Thurs because the tribe's Chief is in town they should probably do an OSWER only meeting since there is that separate "alternate feed material" issue that is theirs. Janet would hear the air issues later in Denver as she has expressed... Make sense?

From: Childers, Pat
Sent: Saturday, March 8, 2014 7:29:09 AM
To: Edwards, Jonathan; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

That's what I needed to know thanks Jonathan

From: Edwards, Jonathan
Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Pat--- The meeting request for Thursday has been coming from OCIR -- Anita Hannon. Will you follow-up on this? Thanks--jon
From: Childers, Pat
Sent: Friday, March 07, 2014 3:51 PM
To: Harrison, Jed; Edwards, Jonathan
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: FW: Meeting request from Chief of Ute Mountain Ute Tribe
Hi Jonathan and Jed
Who has been talking/communicating with the tribe on this issue?
We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all
Pat
From: McCabe, Janet
Sent: Friday, March 07, 2014 3:46 PM
To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

From: Childers, Pat
Sent: Friday, March 07, 2014 2:00:54 PM
To: Flynn, Mike; McCabe, Janet; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks Mike,
I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.
I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.
Pat
From: Flynn, Mike
Sent: Friday, March 07, 2014 1:53 PM
To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe
Janet,
You may have heard this already from Pat, but I wanted to give you a heads that the Chief of the Ute Mountain Ute tribe, located in Colorado, has requested a meeting next week to discuss issues associated

with the White Mesa uranium mill, owned by Energy Fuels, Inc. The Tribe is also scheduled to meet with the Region 8 Administrator on March 17, 2014. The mill is located in southeast Utah. In short, the Tribe is alleging that the facility is in violation of our Subpart W rules and EPA's Off-Site rule (under CERCLA), and is concerned that actions are not being taken against the facility.
Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.
They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.
Mike
Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356
From: Harrison, Jed
Sent: Thursday, March 06, 2014 4:22 PM
To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request
Pat-
Here's the background info on the heads up I gave you. Tribe is Ute Mountain Ute. I misspoke about the request, it came thru OCIR not OITA.
I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief.
However I also understand there's a management retreat on the 13th? I'm sure Mike will bring it up with Janet.
Jed

Jed Harrison Senior Advisor For Tribal Affairs
U.S. Environmental Protection Agency
Office of Radiation & Indoor Air
(702) 784 8218 Mobile: (702) 494 7050

4220 S. Maryland Parkway
Bldg. D, Suite 800
Las Vegas, Nevada 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM
To: Harrison, Jed
Subject: FW: meeting request
For this afternoon's tribal meeting.
From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?
Thx so much!
Arnita
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request
Okay, just got these from the Tribe so attached are two briefing papers.
The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com
-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)

202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request
I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request
Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request
Hi, Arnita.
I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.
I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.
The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.
Pending EPA actions are:
approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.
and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.
I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.
Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com

EPA-3107

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Meeting request from Chief of Ute Mountain Ute Tribe (17).msg

- RE Meeting request from Chief of Ute Mountain Ute Tribe (17).msg

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 5:07 PM
To: Childers, Pat; Hannon, Arnita; Drinkard, Andrea
Cc: Rosnick, Reid; Peake, Tom
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

For OAR, both Janet and Mike F are not available this Thursday. We'd really like to have Janet meet with the Chairman if possible in Denver since this is what Janet indicated she preferred. Thus if OAR attends Thursday, we'd like to have OAR staff (Reid Rosnick and/or Tom Peake) in "listen" mode on Thursday but OSWER lead the meeting knowing that the air issues that the Chairman wants to talk about will be reserved for Janet later….part of the problem is that there was so little heads-up that Janet's calendar couldn't be analyzed to provide more options--- could the Chairman have come into town a little earlier or stay a little later than Thursday, etc.?---- anyway, since Janet is not available Thursday, she really wants to talk with the Chairman when she's out west later this month---- can't we make that happen? ---Jon

From: Childers, Pat
Sent: Monday, March 10, 2014 4:48 PM
To: Hannon, Arnita; Drinkard, Andrea; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Sorry have been in air this whole time. Waiting to board again. Andrea and john if janet can't go we can have staff attend with tom p or mike in attendance for oar. Thoguts

---

From: Hannon, Arnita
Sent: Monday, March 10, 2014 2:35:59 PM
To: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thx Andrea. The DC rep is fine about not having OAR for the headquarters meeting and did not indicate that the tribal Chair could not make the Denver meeting. I am @ the National League of Cities and not back to the office until 5 so if you guys want to talk then I can send out call-in info. OITA is trying to figure out if Jane Nishida will join the meeting. Danny Gogal has accepted from EJ. No one from OSWER has accepted yet. Gee this is an interesting one and I want settled quickly what we are going to do because I am working a LOT of these meetings this week-yikes!
Thx again!

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 6:11:42 PM
To: Childers, Pat; Hannon, Arnita; Edwards, Jonathan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

So I just heard from Region 8 who let me know that the Mountain Utes would not be able to make it to the Denver, March 21st meeting. Did you guys here otherwise from your DC contact?

Arnita/Pat, it may be easier if we talked this through via phone. Give me a call if that's the case. I'm having a hard time keeping track of everything at this point myself.

Thanks!

Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765

From: Childers, Pat
Sent: Monday, March 10, 2014 9:47 AM
To: Hannon, Arnita; Edwards, Jonathan; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Arnita

It sounds like Christine is good for meeting with OAR in Denver on 21 so EPA should focus the DC meeting on Danny and OSWER.

Pat

From: Hannon, Arnita
Sent: Monday, March 10, 2014 9:21:17 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

No worries! Oops-just responded and mentioned that Danny's accepted and OSWER was invited. Thx Pat!

From: Childers, Pat
Sent: Monday, March 10, 2014 12:15:10 PM
To: Hannon, Arnita
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Read your messages iin reverse order. Oar can meet in denver but oswer or danny may want to meet here. I will contact her about denver right now.

From: Hannon, Arnita
Sent: Saturday, March 08, 2014 9:40:03 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Pat thank you so much! It happens that the tribal chairman is going to be in DC so his Washington rep contacted me about a meeting while he is in town. It sounds like it would be more appropriate for the chairman to just join Janet's meeting in Denver if that is your and Janet's guidance on this request. Christine Arbogast is the rep who made the request to me and I will send you her contact info if you want to reach out to her and suggest that the tribal chair meet in Denver instead. If this works, i will cancel the DC meeting. Let me send you her info by pulling up maybe a message from her that has that. Thank you!

From: Childers, Pat
Sent: Saturday, March 8, 2014 12:34:41 PM
To: Hannon, Arnita
Subject: Fw: Meeting request from Chief of Ute Mountain Ute Tribe

Hi Arnita

I understand the Utes have been contacting you or you have a letter from them on coming in for a consultation. We spoke with Janet McCabe and she is already meeting with several of the Ute tribes on March 21 in Denver. We would like to add this meeting with those if possible. Can you see if this is a viable option or give me the info on your contact to coordinate?

Thanks much

Pat
Childers

From: Edwards, Jonathan
Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Pat--- The meeting request for Thursday has been coming from OCIR -- Anita Hannon. Will you follow-up on this? Thanks--jon

From: Childers, Pat
Sent: Friday, March 07, 2014 3:51 PM
To: Harrison, Jed; Edwards, Jonathan
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: FW: Meeting request from Chief of Ute Mountain Ute Tribe

Hi Jonathan and Jed

Who has been talking/communicating with the tribe on this issue?

We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all

Pat

From: McCabe, Janet
Sent: Friday, March 07, 2014 3:46 PM
To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

From: Childers, Pat
Sent: Friday, March 07, 2014 2:00:54 PM
To: Flynn, Mike; McCabe, Janet; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks Mike,

I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.

I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.

Pat

From: Flynn, Mike
Sent: Friday, March 07, 2014 1:53 PM
To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe

Janet,
You may have heard this already from Pat, but I wanted to give you a heads that the Chief of the Ute Mountain Ute tribe, located in Colorado, has requested a meeting next week to discuss issues associated with the White Mesa uranium mill, owned by Energy Fuels, Inc. The Tribe is also scheduled to meet with the Region 8 Administrator on March 17, 2014. The mill is located in southeast Utah. In short, the Tribe is alleging that the facility is in violation of our Subpart W rules and EPA's Off-Site rule (under CERCLA), and is concerned that actions are not being taken against the facility.

Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.

They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.

Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

From: Harrison, Jed
Sent: Thursday, March 06, 2014 4:22 PM
To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request

Pat-

Here's the background info on the heads up I gave you. Tribe is Ute Mountain Ute. I misspoke about the request, it came thru OCIR not OITA.

I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief. However I also understand there's a management retreat on the 13th? I'm sure Mike will bring it up with Janet.

Jed

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM
To: Harrison, Jed
Subject: FW: meeting request

For this afternoon's tribal meeting.

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

Hi All!

Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?

Thx so much!

Arnita

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request

Okay, just got these from the Tribe so attached are two briefing papers.

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Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA

1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request

I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request

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When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request

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I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

Pending EPA actions are:

approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

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Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

EPA-3014

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW Subpart W rule.msg

- FW Subpart W rule.msg

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 6:05 PM
To: Rosnick, Reid; Peake, Tom; Schultheisz, Daniel; Perrin, Alan
Cc: Ferguson, Rafaela
Subject: FW: Subpart W rule

FYI

From: Flynn, Mike
Sent: Monday, March 10, 2014 5:59 PM
To: McCabe, Janet
Cc: Stewart, Lori; Edwards, Jonathan; Knapp, Kristien; White, Rick; Shaw, Betsy
Subject: Subpart W rule

Janet,

Our "Subpart W" proposed rule will be making its way to you soon. This action proposes to revise "National Emission Standards for Operating Uranium Mill Tailings," (Subpart W of 40 CFR part 61) and require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. OMB cleared this package earlier.

This action applies to all facilities that manage uranium byproduct material/tailings, including conventional mills, in-situ leach facilities and heap leach piles. If finalized, the proposed rule would apply to 12 currently operating facilities, including the White Mesa uranium mill which is the subject of recent tribal concerns (Tribal Chief requesting meeting). We worked closely with OSWER (rule adopts RCRA liner stds) and OGC on legal issues; both offices have concurred on the package.

This action satisfies a settlement agreement with two groups: *Colorado Citizens Against Toxic Waste* and *Rocky Mountain Clean Air Action*. We anticipate mixed external reactions.

Let me know if you'd like a brief meeting to get a quick overview of this rule and the various issues when this arrives for your review.

Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

EPA-3108

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Meeting request from Chief of Ute Mountain Ute Tribe (18).msg

- RE Meeting request from Chief of Ute Mountain Ute Tribe (18).msg

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 5:17 PM
To: Edwards, Jonathan; Childers, Pat; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

I, too, had hoped the Denver meeting could work, but according to the region the Tribe was unable to make it to Denver on the 21st, so that option is off the table. I'm adding Carl Daly who was working on the Denver meeting to see if there's anything else to add, but with the two options we currently have on the table it doesn't appear that either works for both parties. I don't have any other ideas, but if anyone else does, feel free to throw them out here.

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 5:06:54 PM
To: Childers, Pat; Hannon, Arnita; Drinkard, Andrea
Cc: Rosnick, Reid; Peake, Tom
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
For OAR, both Janet and Mike F are not available this Thursday. We'd really like to have Janet meet with the Chairman if possible in Denver since this is what Janet indicated she preferred. Thus if OAR attends Thursday, we'd like to have OAR staff (Reid Rosnick and/or Tom Peake) in "listen" mode on Thursday but OSWER lead the meeting knowing that the air issues that the Chairman wants to talk about will be reserved for Janet later….part of the problem is that there was so little heads-up that Janet's calendar couldn't be analyzed to provide more options--- could the Chairman have come into town a little earlier or stay a little later than Thursday, etc.?---- anyway, since Janet is not available Thursday, she really wants to talk with the Chairman when she's out west later this month---- can't we make that happen? ---Jon
From: Childers, Pat
Sent: Monday, March 10, 2014 4:48 PM
To: Hannon, Arnita; Drinkard, Andrea; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Sorry have been in air this whole time. Waiting to board again. Andrea and john if janet can't go we can have staff attend with tom p or mike in attendance for oar. Thoguts

---

From: Hannon, Arnita
Sent: Monday, March 10, 2014 2:35:59 PM
To: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thx Andrea. The DC rep is fine about not having OAR for the headquarters meeting and did not indicate that the tribal Chair could not make the Denver meeting. I am @ the National League of Cities and not back to the office until 5 so if you guys want to talk then I can send out call-in info. OITA is trying to figure out if Jane Nishida will join the meeting. Danny Gogal has accepted from EJ. No one from OSWER has accepted yet. Gee this is an interesting one and I want settled quickly what we are going to do because I am working a LOT of these meetings this week-yikes!
Thx again!

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 6:11:42 PM
To: Childers, Pat; Hannon, Arnita; Edwards, Jonathan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
So I just heard from Region 8 who let me know that the Mountain Utes would not be able to make it to the Denver, March 21st meeting. Did you guys here otherwise from your DC contact?
Arnita/Pat, it may be easier if we talked this through via phone. Give me a call if that's the case. I'm having a hard time keeping track of everything at this point myself.
Thanks!
Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765
From: Childers, Pat
Sent: Monday, March 10, 2014 9:47 AM
To: Hannon, Arnita; Edwards, Jonathan; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Arnita

It sounds like Christine is good for meeting with OAR in Denver on 21 so EPA should focus the DC meeting on Danny and OSWER.

Pat

From: Hannon, Arnita
Sent: Monday, March 10, 2014 9:21:17 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
No worries! Oops-just responded and mentioned that Danny's accepted and OSWER was invited. Thx Pat!

From: Childers, Pat
Sent: Monday, March 10, 2014 12:15:10 PM
To: Hannon, Arnita
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Read your messages iin reverse order. Oar can meet in denver but oswer or danny may want to meet here. I will contact her about denver right now.

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Sent: Saturday, March 08, 2014 9:40:03 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Pat thank you so much! It happens that the tribal chairman is going to be in DC so his Washington rep contacted me about a meeting while he is in town. It sounds like it would be more appropriate for the chairman to just join Janet's meeting in Denver if that is your and Janet's guidance on this request. Christine Arbogast is the rep who made the request to me and I will send you her contact info if you want to reach out to her and suggest that the tribal chair meet in Denver instead. If this works, i will

cancel the DC meeting. Let me send you her info by pulling up maybe a message from her that has that. Thank you!

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Subject: Fw: Meeting request from Chief of Ute Mountain Ute Tribe
Hi Arnita

I understand the Utes have been contacting you or you have a letter from them on coming in for a consultation. We spoke with Janet McCabe and she is already meeting with several of the Ute tribes on March 21 in Denver. We would like to add this meeting with those if possible. Can you see if this is a viable option or give me the info on your contact to coordinate?

Thanks much

Pat
Childers

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Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
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Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: FW: Meeting request from Chief of Ute Mountain Ute Tribe
Hi Jonathan and Jed
Who has been talking/communicating with the tribe on this issue?
We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all
Pat
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Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

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Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks Mike,
I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.
I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.
Pat
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To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe
Janet,
You may have heard this already from Pat, but I wanted to give you a heads that the Chief of the Ute Mountain Ute tribe, located in Colorado, has requested a meeting next week to discuss issues associated with the White Mesa uranium mill, owned by Energy Fuels, Inc. The Tribe is also scheduled to meet with the Region 8 Administrator on March 17, 2014. The mill is located in southeast Utah. In short, the Tribe is alleging that the facility is in violation of our Subpart W rules and EPA's Off-Site rule (under CERCLA), and is concerned that actions are not being taken against the facility.
Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.
They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.
Mike
Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356
From: Harrison, Jed
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To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request
Pat-
Here's the background info on the heads up I gave you. Tribe is Ute Mountain Ute. I misspoke about the request, it came thru OCIR not OITA.
I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief. However I also understand there's a management retreat on the 13th? I'm sure Mike will bring it up with Janet.
Jed

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM
To: Harrison, Jed
Subject: FW: meeting request
For this afternoon's tribal meeting.
From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request
Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?
Thx so much!
Arnita
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request
Okay, just got these from the Tribe so attached are two briefing papers.
The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....
Christine Arbogast

Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com
-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request
I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request
Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request
Hi, Arnita.
I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.
The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.
Pending EPA actions are:
approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.
and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.
I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.
Thanks so much Arnita. I so appreciate the help you have given me.

Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com

EPA-3109

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Meeting request from Chief of Ute Mountain Ute Tribe (19).msg

- Re Meeting request from Chief of Ute Mountain Ute Tribe (19).msg

From: Hannon, Arnita
Sent: Monday, March 10, 2014 5:22 PM
To: Edwards, Jonathan; Childers, Pat; Drinkard, Andrea
Cc: Rosnick, Reid; Peake, Tom; Deitz, Randy; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks very much Jonathan. Let me talk to the Washington rep to see if the Chairman can see Janet when she conducts the March 21 meeting in Denver with the Ute tribe. Oops I think I saw trafic already that says the Chair cannot make it to Denver. I am also looping OSWER since I asked Randy Deitz to help us find appropriate OSWER folks for the Thursday meeting. Actually the Chairman could do a meeting on Friday up until 3 pm but not sure how that would work for everyone and I'd prefer to work with his rep to get him to Denver.
Might we just have those who have ACCEPTED the meeting (OAR and Danny Gogal) just meet with the Chair when he is here on Thursday and as you suggested, have Reid and Tom in "listen" mode? Also for the meeting Janet is doing in Denver, might the Chair be able to call into the meeting?
Thx all!

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
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202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

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Sent: Monday, March 10, 2014 5:07 PM
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Thanks!

Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765

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Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
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U.S. EPA
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Jed

Jed Harrison Senior Advisor For Tribal Affairs
U.S. Environmental Protection Agency
Office of Radiation & Indoor Air
(702) 784 8218 mobile: (702) 494 7050

4220 S. Maryland Parkway
Bldg. D, Suite 800
Las Vegas, Nevada 89119

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For this afternoon's tribal meeting.

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Cc: Wood, MelanieL; McClendon, Marcus
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Thx so much!

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When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request

Hi, Arnita.

I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

Pending EPA actions are:

approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.

Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

EPA-3110

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Meeting request from Chief of Ute Mountain Ute Tribe (20).msg

- Re Meeting request from Chief of Ute Mountain Ute Tribe (20).msg

From: Childers, Pat
Sent: Monday, March 10, 2014 5:25 PM
To: Drinkard, Andrea; Edwards, Jonathan; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Check tom powers schedule or betsies and have one of them attend with oria staff. If not available highest oria person available. Jim democker could also be a default all oar folks would need a quick up to speed briefing.

Pat

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 5:17:00 PM
To: Edwards, Jonathan; Childers, Pat; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
I, too, had hoped the Denver meeting could work, but according to the region the Tribe was unable to make it to Denver on the 21st, so that option is off the table. I'm adding Carl Daly who was working on the Denver meeting to see if there's anything else to add, but with the two options we currently have on the table it doesn't appear that either works for both parties. I don't have any other ideas, but if anyone else does, feel free to throw them out here.

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 5:06:54 PM
To: Childers, Pat; Hannon, Arnita; Drinkard, Andrea
Cc: Rosnick, Reid; Peake, Tom
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
For OAR, both Janet and Mike F are not available this Thursday. We'd really like to have Janet meet with the Chairman if possible in Denver since this is what Janet indicated she preferred. Thus if OAR attends Thursday, we'd like to have OAR staff (Reid Rosnick and/or Tom Peake) in "listen" mode on Thursday but OSWER lead the meeting knowing that the air issues that the Chairman wants to talk about will be reserved for Janet later….part of the problem is that there was so little heads-up that Janet's calendar couldn't be analyzed to provide more options--- could the Chairman have come into town a little earlier or stay a little later than Thursday, etc.?---- anyway, since Janet is not available Thursday, she really wants to talk with the Chairman when she's out west later this month---- can't we make that happen? ---
Jon
From: Childers, Pat
Sent: Monday, March 10, 2014 4:48 PM
To: Hannon, Arnita; Drinkard, Andrea; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Sorry have been in air this whole time. Waiting to board again. Andrea and john if janet can't go we can have staff attend with tom p or mike in attendance for oar. Thoguts

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From: Hannon, Arnita
Sent: Monday, March 10, 2014 2:35:59 PM

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Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thx Andrea. The DC rep is fine about not having OAR for the headquarters meeting and did not indicate that the tribal Chair could not make the Denver meeting. I am @ the National League of Cities and not back to the office until 5 so if you guys want to talk then I can send out call-in info. OITA is trying to figure out if Jane Nishida will join the meeting. Danny Gogal has accepted from EJ. No one from OSWER has accepted yet. Gee this is an interesting one and I want settled quickly what we are going to do because I am working a LOT of these meetings this week-yikes!
Thx again!

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 6:11:42 PM
To: Childers, Pat; Hannon, Arnita; Edwards, Jonathan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
So I just heard from Region 8 who let me know that the Mountain Utes would not be able to make it to the Denver, March 21st meeting. Did you guys here otherwise from your DC contact?
Arnita/Pat, it may be easier if we talked this through via phone. Give me a call if that's the case. I'm having a hard time keeping track of everything at this point myself.
Thanks!
Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765
From: Childers, Pat
Sent: Monday, March 10, 2014 9:47 AM
To: Hannon, Arnita; Edwards, Jonathan; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Arnita

It sounds like Christine is good for meeting with OAR in Denver on 21 so EPA should focus the DC meeting on Danny and OSWER.

Pat

From: Hannon, Arnita
Sent: Monday, March 10, 2014 9:21:17 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
No worries! Oops-just responded and mentioned that Danny's accepted and OSWER was invited. Thx Pat!

From: Childers, Pat
Sent: Monday, March 10, 2014 12:15:10 PM
To: Hannon, Arnita
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Read your messages iin reverse order. Oar can meet in denver but oswer or danny may want to meet here. I will contact her about denver right now.

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To: Childers, Pat
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Pat thank you so much! It happens that the tribal chairman is going to be in DC so his Washington rep contacted me about a meeting while he is in town. It sounds like it would be more appropriate for the chairman to just join Janet's meeting in Denver if that is your and Janet's guidance on this request. Christine Arbogast is the rep who made the request to me and I will send you her contact info if you want to reach out to her and suggest that the tribal chair meet in Denver instead. If this works, i will cancel the DC meeting. Let me send you her info by pulling up maybe a message from her that has that. Thank you!

From: Childers, Pat
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Hi Arnita

I understand the Utes have been contacting you or you have a letter from them on coming in for a consultation. We spoke with Janet McCabe and she is already meeting with several of the Ute tribes on March 21 in Denver. We would like to add this meeting with those if possible. Can you see if this is a viable option or give me the info on your contact to coordinate?

Thanks much

Pat
Childers

From: Edwards, Jonathan
Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
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Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
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Hi Jonathan and Jed
Who has been talking/communicating with the tribe on this issue?
We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all
Pat

From: McCabe, Janet
Sent: Friday, March 07, 2014 3:46 PM
To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

From: Childers, Pat
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To: Flynn, Mike; McCabe, Janet; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks Mike,
I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.
I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.
Pat
From: Flynn, Mike
Sent: Friday, March 07, 2014 1:53 PM
To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe
Janet,
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Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.
They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.
Mike
Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356
From: Harrison, Jed
Sent: Thursday, March 06, 2014 4:22 PM
To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request
Pat-

Here's the background info on the heads up I gave you. Tribe is Ute Mountain Ute. I misspoke about the request, it came thru OCIR not OITA.
I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief.
However I also understand there's a management retreat on the 13th? I'm sure Mike will bring it up with Janet.
Jed

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM
To: Harrison, Jed
Subject: FW: meeting request
For this afternoon's tribal meeting.
From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request
Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?
Thx so much!
Arnita

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM

To: Hannon, Arnita
Subject: Re: meeting request
Okay, just got these from the Tribe so attached are two briefing papers.
The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....
Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com
-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request
I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request
Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
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Subject: meeting request

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EPA-3111

Reid Rosnick

To	
cc	
bcc	
Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Meeting request from Chief of Ute Mountain Ute Tribe (21).msg

- RE Meeting request from Chief of Ute Mountain Ute Tribe (21).msg

From: Hannon, Arnita
Sent: Monday, March 10, 2014 5:32 PM
To: Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks to everyone and so sorry that this is quite an ordeal. I am going to just see who you all want me to add to the invite but just so you know, Danny Gogal from EJ is confirmed and Jane Nishida from OITA is confirmed. Randy Deitz from OSWER is working on the Superfund program's attendance because he said he can see that there's a Superfund issue.
For now it looks like this meeting will go but I want someone to please tell me whether the Chair will be able to at least call into the March 21 meeting Janet is doing in Denver or if you think that is a good option to offer the Chair.

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
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hannon.arnita@epa.gov

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To: Drinkard, Andrea; Edwards, Jonathan; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
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Pat

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Sent: Monday, March 10, 2014 5:17:00 PM
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Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

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To: Childers, Pat; Hannon, Arnita; Drinkard, Andrea
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Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

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Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765

From: Childers, Pat
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To: Hannon, Arnita; Edwards, Jonathan; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

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Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

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Hi Jonathan and Jed

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To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

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Office of Radiation & Indoor Air
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202-343-9356

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Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

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Subject: FW: meeting request

For this afternoon's tribal meeting.

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Cc: Wood, MelanieL; McClendon, Marcus
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M. Arnita Hannon
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To: Hannon, Arnita
Subject: Re: meeting request

Okay, just got these from the Tribe so attached are two briefing papers.

The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....

Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655

www.kogovsekandassociates.com

-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!

M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA

1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request

I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request

Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request

Hi, Arnita.

I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.

The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.

Pending EPA actions are:

approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.

and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.

I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.

Thanks so much Arnita. I so appreciate the help you have given me.
Christine Arbogast
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EPA-3112

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Meeting request from Chief of Ute Mountain Ute Tribe (22).msg

- RE Meeting request from Chief of Ute Mountain Ute Tribe (22).msg

From: Rosnick, Reid
Sent: Tuesday, March 11, 2014 6:17 AM
To: Hannon, Arnita; Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Arnita,

Just confirming what Jon Edwards has stated, I'll be at the meeting on Thursday.

Reid

From: Hannon, Arnita
Sent: Monday, March 10, 2014 5:32 PM
To: Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks to everyone and so sorry that this is quite an ordeal. I am going to just see who you all want me to add to the invite but just so you know, Danny Gogal from EJ is confirmed and Jane Nishida from OITA is confirmed. Randy Deitz from OSWER is working on the Superfund program's attendance because he said he can see that there's a Superfund issue.
For now it looks like this meeting will go but I want someone to please tell me whether the Chair will be able to at least call into the March 21 meeting Janet is doing in Denver or if you think that is a good option to offer the Chair.

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From: Childers, Pat
Sent: Monday, March 10, 2014 5:25 PM
To: Drinkard, Andrea; Edwards, Jonathan; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Check tom powers schedule or betsies and have one of them attend with oria staff. If not available highest oria person available. Jim democker could also be a default all oar folks would need a quick up to speed briefing.

Pat

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 5:17:00 PM
To: Edwards, Jonathan; Childers, Pat; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

I, too, had hoped the Denver meeting could work, but according to the region the Tribe was unable to make it to Denver on the 21st, so that option is off the table. I'm adding Carl Daly who was working on the Denver meeting to see if there's anything else to add, but with the two options we currently have on the table it doesn't appear that either works for both parties. I don't have any other ideas, but if anyone else does, feel free to throw them out here.

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 5:06:54 PM
To: Childers, Pat; Hannon, Arnita; Drinkard, Andrea
Cc: Rosnick, Reid; Peake, Tom
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

For OAR, both Janet and Mike F are not available this Thursday. We'd really like to have Janet meet with the Chairman if possible in Denver since this is what Janet indicated she preferred. Thus if OAR attends Thursday, we'd like to have OAR staff (Reid Rosnick and/or Tom Peake) in "listen" mode on Thursday but OSWER lead the meeting knowing that the air issues that the Chairman wants to talk about will be reserved for Janet later….part of the problem is that there was so little heads-up that Janet's calendar couldn't be analyzed to provide more options--- could the Chairman have come into town a little earlier or stay a little later than Thursday, etc.?---- anyway, since Janet is not available Thursday, she really wants to talk with the Chairman when she's out west later this month---- can't we make that happen? ---Jon

From: Childers, Pat
Sent: Monday, March 10, 2014 4:48 PM
To: Hannon, Arnita; Drinkard, Andrea; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Sorry have been in air this whole time. Waiting to board again. Andrea and john if janet can't go we can have staff attend with tom p or mike in attendance for oar. Thoguts

---

From: Hannon, Arnita
Sent: Monday, March 10, 2014 2:35:59 PM
To: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thx Andrea. The DC rep is fine about not having OAR for the headquarters meeting and did not indicate that the tribal Chair could not make the Denver meeting. I am @ the National League of Cities and not back to the office until 5 so if you guys want to talk then I can send out call-in info. OITA is trying to figure out if Jane Nishida will join the meeting. Danny Gogal has accepted from EJ. No one from OSWER

has accepted yet. Gee this is an interesting one and I want settled quickly what we are going to do because I am working a LOT of these meetings this week-yikes!
Thx again!

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 6:11:42 PM
To: Childers, Pat; Hannon, Arnita; Edwards, Jonathan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

So I just heard from Region 8 who let me know that the Mountain Utes would not be able to make it to the Denver, March 21st meeting. Did you guys here otherwise from your DC contact?

Arnita/Pat, it may be easier if we talked this through via phone. Give me a call if that's the case. I'm having a hard time keeping track of everything at this point myself.

Thanks!

Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765

From: Childers, Pat
Sent: Monday, March 10, 2014 9:47 AM
To: Hannon, Arnita; Edwards, Jonathan; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Arnita

It sounds like Christine is good for meeting with OAR in Denver on 21 so EPA should focus the DC meeting on Danny and OSWER.

Pat

From: Hannon, Arnita
Sent: Monday, March 10, 2014 9:21:17 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

No worries! Oops-just responded and mentioned that Danny's accepted and OSWER was invited. Thx Pat!

From: Childers, Pat
Sent: Monday, March 10, 2014 12:15:10 PM
To: Hannon, Arnita
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Read your messages iin reverse order. Oar can meet in denver but oswer or danny may want to meet here. I will contact her about denver right now.

From: Hannon, Arnita
Sent: Saturday, March 08, 2014 9:40:03 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Pat thank you so much! It happens that the tribal chairman is going to be in DC so his Washington rep contacted me about a meeting while he is in town. It sounds like it would be more appropriate for the chairman to just join Janet's meeting in Denver if that is your and Janet's guidance on this request. Christine Arbogast is the rep who made the request to me and I will send you her contact info if you want to reach out to her and suggest that the tribal chair meet in Denver instead. If this works, i will cancel the DC meeting. Let me send you her info by pulling up maybe a message from her that has that. Thank you!

From: Childers, Pat
Sent: Saturday, March 8, 2014 12:34:41 PM
To: Hannon, Arnita
Subject: Fw: Meeting request from Chief of Ute Mountain Ute Tribe

Hi Arnita

I understand the Utes have been contacting you or you have a letter from them on coming in for a consultation. We spoke with Janet McCabe and she is already meeting with several of the Ute tribes on March 21 in Denver. We would like to add this meeting with those if possible. Can you see if this is a viable option or give me the info on your contact to coordinate?

Thanks much

Pat
Childers

From: Edwards, Jonathan
Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Pat--- The meeting request for Thursday has been coming from OCIR -- Anita Hannon. Will you follow-up on this? Thanks--jon

From: Childers, Pat
Sent: Friday, March 07, 2014 3:51 PM
To: Harrison, Jed; Edwards, Jonathan
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: FW: Meeting request from Chief of Ute Mountain Ute Tribe

Hi Jonathan and Jed

Who has been talking/communicating with the tribe on this issue?

We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all

Pat

From: McCabe, Janet
Sent: Friday, March 07, 2014 3:46 PM
To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

From: Childers, Pat
Sent: Friday, March 07, 2014 2:00:54 PM
To: Flynn, Mike; McCabe, Janet; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks Mike,

I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.

I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.

Pat

From: Flynn, Mike
Sent: Friday, March 07, 2014 1:53 PM
To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe

Janet,
You may have heard this already from Pat, but I wanted to give you a heads that the Chief of the Ute Mountain Ute tribe, located in Colorado, has requested a meeting next week to discuss issues associated with the White Mesa uranium mill, owned by Energy Fuels, Inc. The Tribe is also scheduled to meet with the Region 8 Administrator on March 17, 2014. The mill is located in southeast Utah. In short, the Tribe is alleging that the facility is in violation of our Subpart W rules and EPA's Off-Site rule (under CERCLA), and is concerned that actions are not being taken against the facility.

Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.

They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.

Mike

Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356

From: Harrison, Jed
Sent: Thursday, March 06, 2014 4:22 PM
To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request

Pat-

Here's the background info on the heads up I gave you. Tribe is Ute Mountain Ute. I misspoke about the request, it came thru OCIR not OITA.

I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief. However I also understand there's a management retreat on the 13th? I'm sure Mike will bring it up with Janet.

Jed

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM

To: Harrison, Jed
Subject: FW: meeting request

For this afternoon's tribal meeting.

From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request

Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?

Thx so much!

Arnita

M. Arnita Hannon
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From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
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To: Hannon, Arnita
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EPA-3113

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Meeting request from Chief of Ute Mountain Ute Tribe (23).msg

- Re Meeting request from Chief of Ute Mountain Ute Tribe (23).msg

From: Childers, Pat
Sent: Tuesday, March 11, 2014 7:54 AM
To: Rosnick, Reid
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks Reid

From: Rosnick, Reid
Sent: Tuesday, March 11, 2014 3:16:45 AM
To: Hannon, Arnita; Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
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Check tom powers schedule or betsies and have one of them attend with oria staff. If not available highest oria person available. Jim democker could also be a default all oar folks would need a quick up to speed briefing.

Pat

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EPA Office of Air and Radiation
(w) 202.564.1601
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Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

From: Childers, Pat
Sent: Friday, March 07, 2014 2:00:54 PM

To: Flynn, Mike; McCabe, Janet; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks Mike,
I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.
I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.
Pat
From: Flynn, Mike
Sent: Friday, March 07, 2014 1:53 PM
To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe
Janet,
You may have heard this already from Pat, but I wanted to give you a heads that the Chief of the Ute Mountain Ute tribe, located in Colorado, has requested a meeting next week to discuss issues associated with the White Mesa uranium mill, owned by Energy Fuels, Inc. The Tribe is also scheduled to meet with the Region 8 Administrator on March 17, 2014. The mill is located in southeast Utah. In short, the Tribe is alleging that the facility is in violation of our Subpart W rules and EPA's Off-Site rule (under CERCLA), and is concerned that actions are not being taken against the facility.
Utah is an agreement state with NRC, and is also authorized to run the Subpart W program in lieu of EPA. The Grand Canyon Trust has filed a notice of intent to sue Energy Fuels over alleged violations of Subpart W and EPA's Off-Site rule. The Tribe's questions for EPA mimic the allegations of the proposed lawsuit. The attached briefing sheets are from the tribe.
They are requesting a meeting for next Thursday, the day of our retreat. We'll coordinate with Pat and OCIR on how to best handle.
Mike
Mike Flynn, Director
Office of Radiation & Indoor Air
U.S. EPA
202-343-9356
From: Harrison, Jed
Sent: Thursday, March 06, 2014 4:22 PM
To: Childers, Pat
Cc: Flynn, Mike; Edwards, Jonathan; Cherepy, Andrea; Rosnick, Reid
Subject: FW: meeting request
Pat-
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I indicated to Mike that Janet would be the appropriate person from OAR to meet with the Chief. However I also understand there's a management retreat on the 13th? I'm sure Mike will bring it up with Janet.
Jed

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Rosnick, Reid
Sent: Thursday, March 06, 2014 11:00 AM
To: Harrison, Jed
Subject: FW: meeting request
For this afternoon's tribal meeting.
From: Hannon, Arnita
Sent: Wednesday, March 05, 2014 5:48 PM
To: Dubin, Noah; Gogal, Danny; Rosnick, Reid
Cc: Wood, MelanieL; McClendon, Marcus
Subject: FW: meeting request
Hi All!
Might you all please review the meeting request I received below on behalf of the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well? I am trying to determine who the Tribal Chief should meet with when he is in DC on March 13. Can you all please advise?
Thx so much!
Arnita
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 5:37 PM
To: Hannon, Arnita
Subject: Re: meeting request
Okay, just got these from the Tribe so attached are two briefing papers.
The Tribal environmental lead just noted to me that two gentlemen--Danny Gogal from environmental jsutice and Reid Rosnick from NESHAPS might be good people to have in the meeting as well as the tribal office. But I will follow your advice ....
Christine Arbogast

Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com
-----Original Message-----
From: Hannon, Arnita <Hannon.Arnita@epa.gov>
To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
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240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov
From: rkogovsek@aol.com [mailto:rkogovsek@aol.com]
Sent: Wednesday, March 05, 2014 7:32 AM
To: Hannon, Arnita
Subject: Re: meeting request
I am so sorry...I was so wrapped up in explaining the issues I left out that key piece.

In DC, Thursday the 13th of March between 11 and 4 or Friday the 14th anytime but concluding by 3 pm.
Sent on the Now Network™ from my Sprint® BlackBerry

From: "Hannon, Arnita" <Hannon.Arnita@epa.gov>
Date: Tue, 4 Mar 2014 20:56:03 +0000
To: rkogovsek@aol.com<rkogovsek@aol.com>
Subject: Re: meeting request
Hi!
When do you want this meeting and are you talking in DC? I will defer to our Tribal oFfice about how to handle. Thx!

From: rkogovsek@aol.com <rkogovsek@aol.com>
Sent: Tuesday, March 4, 2014 8:17:25 PM
To: Hannon, Arnita
Subject: meeting request
Hi, Arnita.
I am writing to set up a meeting with EPA for the Ute Mountain Ute Tribe, which is headquartered in the extreme southwest region of Colorado, with a small community in eastern Utah as well.

I do not know if your intergovernmental relations efforts also involve tribal governments. If not, can you please loop me in to those at EPA who handle tribal issues.
The issues which the Tribal Chairman, Manuel Heart, wishes to discuss regard a uranium mill in Utah near the tribal community in White Mesa.
Pending EPA actions are:
approval of the transfer of alternative feed material from Washington State to White Mesa if EPA determines that the criteria of the off-site rule are met.
and, the mill is in violation of the National Emission Standard for Radon Emission (EPA agrees) but no enforcement action is being taken, allegedly because some of the impoundments are covered by water.
I should have briefing papers on these issues by tomorrow morning, but hope that is enough for you to determine if you can help me set up a meeting or if you need to send me to someone else who deals with tribal relations.
Thanks so much Arnita. I so appreciate the help you have given me.

Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com

EPA-3114

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Re Meeting request from Chief of Ute Mountain Ute Tribe (24).msg

- Re Meeting request from Chief of Ute Mountain Ute Tribe (24).msg

From: Hannon, Arnita
Sent: Tuesday, March 11, 2014 8:27 AM
To: Rosnick, Reid; Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny; Wood, MelanieL
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thanks very much Reid. So at this meeting we will have the following offices represented by my count: OAR; EJ; OITA; OSWER.
Remaining outstanding: whether Tribal Chair Heart can participate in the meeting Janet is having in Denver on 3-21 with the Ute tribe. The Chair has not answered that question. And your folks have not answered whether he can call into the meeting if he cannot travel to Denver. Anyway, I must focus on what will happen here @ headquarters on Thursday and hope whatever Heart is going to do about the 3-21 meeting pans out and will leave that to OAR to work out.
Thx Everyone! Really appreciate.

From: Rosnick, Reid
Sent: Tuesday, March 11, 2014 10:16:45 AM
To: Hannon, Arnita; Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Arnita,
Just confirming what Jon Edwards has stated, I'll be at the meeting on Thursday.
Reid
From: Hannon, Arnita
Sent: Monday, March 10, 2014 5:32 PM
To: Childers, Pat; Drinkard, Andrea; Edwards, Jonathan
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl; Deitz, Randy; Chase, JoAnn; Gogal, Danny
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks to everyone and so sorry that this is quite an ordeal. I am going to just see who you all want me to add to the invite but just so you know, Danny Gogal from EJ is confirmed and Jane Nishida from OITA is confirmed. Randy Deitz from OSWER is working on the Superfund program's attendance because he said he can see that there's a Superfund issue.
For now it looks like this meeting will go but I want someone to please tell me whether the Chair will be able to at least call into the March 21 meeting Janet is doing in Denver or if you think that is a good option to offer the Chair.
M. Arnita Hannon
Intergovernmental Liaison
Office of Congressional and Intergovernmental Relations
US EPA
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
202.564.3704 (O)
202.302.9109 (M)
240.602.7118 (C)
202.501.1545 (Fax)
hannon.arnita@epa.gov

From: Childers, Pat
Sent: Monday, March 10, 2014 5:25 PM
To: Drinkard, Andrea; Edwards, Jonathan; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Check tom powers schedule or betsies and have one of them attend with oria staff. If not available highest oria person available. Jim democker could also be a default all oar folks would need a quick up to speed briefing.

Pat

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 5:17:00 PM
To: Edwards, Jonathan; Childers, Pat; Hannon, Arnita
Cc: Rosnick, Reid; Peake, Tom; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
I, too, had hoped the Denver meeting could work, but according to the region the Tribe was unable to make it to Denver on the 21st, so that option is off the table. I'm adding Carl Daly who was working on the Denver meeting to see if there's anything else to add, but with the two options we currently have on the table it doesn't appear that either works for both parties. I don't have any other ideas, but if anyone else does, feel free to throw them out here.

From: Edwards, Jonathan
Sent: Monday, March 10, 2014 5:06:54 PM
To: Childers, Pat; Hannon, Arnita; Drinkard, Andrea
Cc: Rosnick, Reid; Peake, Tom
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
For OAR, both Janet and Mike F are not available this Thursday. We'd really like to have Janet meet with the Chairman if possible in Denver since this is what Janet indicated she preferred. Thus if OAR attends Thursday, we'd like to have OAR staff (Reid Rosnick and/or Tom Peake) in "listen" mode on Thursday but OSWER lead the meeting knowing that the air issues that the Chairman wants to talk about will be reserved for Janet later….part of the problem is that there was so little heads-up that Janet's calendar couldn't be analyzed to provide more options--- could the Chairman have come into town a little earlier or stay a little later than Thursday, etc.?---- anyway, since Janet is not available Thursday, she really wants to talk with the Chairman when she's out west later this month---- can't we make that happen? ---
Jon
From: Childers, Pat
Sent: Monday, March 10, 2014 4:48 PM
To: Hannon, Arnita; Drinkard, Andrea; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Sorry have been in air this whole time. Waiting to board again. Andrea and john if janet can't go we can have staff attend with tom p or mike in attendance for oar. Thoguts

---

From: Hannon, Arnita
Sent: Monday, March 10, 2014 2:35:59 PM
To: Drinkard, Andrea; Childers, Pat; Edwards, Jonathan
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe

Thx Andrea. The DC rep is fine about not having OAR for the headquarters meeting and did not indicate that the tribal Chair could not make the Denver meeting. I am @ the National League of Cities and not back to the office until 5 so if you guys want to talk then I can send out call-in info. OITA is trying to figure out if Jane Nishida will join the meeting. Danny Gogal has accepted from EJ. No one from OSWER has accepted yet. Gee this is an interesting one and I want settled quickly what we are going to do because I am working a LOT of these meetings this week-yikes!
Thx again!

From: Drinkard, Andrea
Sent: Monday, March 10, 2014 6:11:42 PM
To: Childers, Pat; Hannon, Arnita; Edwards, Jonathan
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
So I just heard from Region 8 who let me know that the Mountain Utes would not be able to make it to the Denver, March 21st meeting. Did you guys here otherwise from your DC contact?
Arnita/Pat, it may be easier if we talked this through via phone. Give me a call if that's the case. I'm having a hard time keeping track of everything at this point myself.
Thanks!
Andrea Drinkard
EPA Office of Air and Radiation
(w) 202.564.1601
(c) 202.236.7765
From: Childers, Pat
Sent: Monday, March 10, 2014 9:47 AM
To: Hannon, Arnita; Edwards, Jonathan; Drinkard, Andrea
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Arnita

It sounds like Christine is good for meeting with OAR in Denver on 21 so EPA should focus the DC meeting on Danny and OSWER.

Pat

From: Hannon, Arnita
Sent: Monday, March 10, 2014 9:21:17 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
No worries! Oops-just responded and mentioned that Danny's accepted and OSWER was invited. Thx Pat!

From: Childers, Pat
Sent: Monday, March 10, 2014 12:15:10 PM
To: Hannon, Arnita
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Read your messages iin reverse order. Oar can meet in denver but oswer or danny may want to meet here. I will contact her about denver right now.

From: Hannon, Arnita
Sent: Saturday, March 08, 2014 9:40:03 AM
To: Childers, Pat
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Pat thank you so much! It happens that the tribal chairman is going to be in DC so his Washington rep contacted me about a meeting while he is in town. It sounds like it would be more appropriate for the chairman to just join Janet's meeting in Denver if that is your and Janet's guidance on this request. Christine Arbogast is the rep who made the request to me and I will send you her contact info if you want to reach out to her and suggest that the tribal chair meet in Denver instead. If this works, i will cancel the DC meeting. Let me send you her info by pulling up maybe a message from her that has that. Thank you!

From: Childers, Pat
Sent: Saturday, March 8, 2014 12:34:41 PM
To: Hannon, Arnita
Subject: Fw: Meeting request from Chief of Ute Mountain Ute Tribe
Hi Arnita

I understand the Utes have been contacting you or you have a letter from them on coming in for a consultation. We spoke with Janet McCabe and she is already meeting with several of the Ute tribes on March 21 in Denver. We would like to add this meeting with those if possible. Can you see if this is a viable option or give me the info on your contact to coordinate?

Thanks much

Pat
Childers

From: Edwards, Jonathan
Sent: Friday, March 07, 2014 3:53:40 PM
To: Childers, Pat; Harrison, Jed
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Pat--- The meeting request for Thursday has been coming from OCIR -- Anita Hannon. Will you follow-up on this? Thanks--jon
From: Childers, Pat
Sent: Friday, March 07, 2014 3:51 PM
To: Harrison, Jed; Edwards, Jonathan
Cc: Daly, Carl; Flynn, Mike; Drinkard, Andrea
Subject: FW: Meeting request from Chief of Ute Mountain Ute Tribe
Hi Jonathan and Jed
Who has been talking/communicating with the tribe on this issue?
We need to get back to them to see if they can do the March 21st date when Janet is in Denver, since that is her preference.

thanks all
Pat

From: McCabe, Janet
Sent: Friday, March 07, 2014 3:46 PM
To: Childers, Pat; Flynn, Mike; Baca, Andrew
Cc: Edwards, Jonathan; Harrison, Jed; Drinkard, Andrea; Daly, Carl
Subject: Re: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks everyone. It sounds like we're going to try to combine this into the meeting I was already planning to have while in Denver. Plenty of time to get briefed before then.

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Cc: Edwards, Jonathan; Harrison, Jed; Baca, Andrew; Drinkard, Andrea; Daly, Carl
Subject: RE: Meeting request from Chief of Ute Mountain Ute Tribe
Thanks Mike,
I mentioned to Jed that Janet was possibly visiting several of the UTE tribes in Denver on March 21 (I believe) and that there may be potential to tie the two meetings together.
I am including Andrew Baca from OITA on this message and Andrea Drinkard a who is assisting with the March 21 visit.
Pat
From: Flynn, Mike
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To: McCabe, Janet
Cc: Edwards, Jonathan; Harrison, Jed; Childers, Pat
Subject: Meeting request from Chief of Ute Mountain Ute Tribe
Janet,
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U.S. EPA
202-343-9356
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Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
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4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

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Sent: Thursday, March 06, 2014 11:00 AM
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For this afternoon's tribal meeting.
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Sent: Wednesday, March 05, 2014 5:48 PM
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Cc: Wood, MelanieL; McClendon, Marcus
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Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com

-----Original Message-----
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To: rkogovsek <rkogovsek@aol.com>
Sent: Wed, Mar 5, 2014 3:07 pm
Subject: RE: meeting request

Hey Christine – Do you have background papers on the issues at hand yet? I'm trying to identify appropriate staff for this meeting and also IF it is appropriate for headquarters to be meeting with this group. Stay tuned. Thx!

M. Arnita Hannon
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Office of Congressional and Intergovernmental Relations
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Pending EPA actions are:
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Christine Arbogast
Kogovsek & Associates, Inc.
(720) 373-3655
www.kogovsekandassociates.com

EPA-3016

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW update on NESHAPS for uranium mill tailings .msg

- FW update on NESHAPS for uranium mill tailings .msg

From: Rosnick, Reid
Sent: Tuesday, February 25, 2014 3:41 PM
To: Patefield, Scott
Subject: FW: update on NESHAPS for uranium mill tailings

Scott,

I remembered to copy Angelique, but not you. My apologies. Below is the note I sent to Scott Clow. Again, sorry.

Reid

From: Rosnick, Reid
Sent: Thursday, July 11, 2013 12:14 PM
To: sclow@utemountain.org
Cc: Diaz, Angelique; tnatori@utemountain.org; Celene Hawkins; H. Michael Keller; Colin Larrick
Subject: RE: update on NESHAPS for uranium mill tailings

Dear Scott,

It has been a couple of years since we met in White Mesa, I hope all is well with you. Thank you for your comments on the status of the impoundments at the White Mesa mill. I have also been in discussions with EPA's Region 8 office, as well as the Utah Division of Air Quality, which has been delegated authority to operate the Subpart W program. Both EPA HQ and the Region 8 office have been in discussions over this issue. EPA agrees with your determination that the White Mesa Mill is currently out of compliance with the limitation on the number of impoundments allowed by Subpart W. However, since two of the impoundments are being used as ponds, the mass flux of radon would be calculated to be zero. Since there would be no calculated health impacts from the additional impoundments being used as holding ponds, the Region does not plan to pursue enforcement at this time.

Regarding a Tribal consultation on the proposed Subpart W rulemaking, the package is currently under review by the Office of Management and Budget. As soon as that review has concluded I will be in touch to discuss consultations. Thanks, Scott.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Tuesday, July 09, 2013 12:21 PM
To: Rosnick, Reid
Cc: Diaz, Angelique; tnatori@utemountain.org; Celene Hawkins; H. Michael Keller; Colin Larrick
Subject: update on NESHAPS for uranium mill tailings

Dear Mr. Rosnick,
It has been a long time since we met in White Mesa, Utah. I have checked in with Angelique Diaz at region 8 periodically on this subject, and 2 weeks ago we were informed by the Utah DRC that EPA has

periodic conference calls with them regarding the implementation of this law and its pending improvements.
DRC stands by the position that only 2 tailings cells are in use at the White Mesa facility, but it is our understanding that all 3 of the old cells are in use as well as the 2 new 40-acre cells. We have not been able to find any documentation that describes when Cell 2 went in to "final closure" as described in the NESHAPS law, so we consider it to be "in use" as described in the current radioactive materials license for the facility.

Please inform us of how this situation is viewed from your perspective and when we might have the opportunity for Tribal consultation on the revised NESHAPS law.
Thanks,
Scott Clow
Environmental Programs Director
Ute Mountain Ute Tribe

EPA-3040

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Note from Mike to Janet - NESHAP Subpart W.msg

- Note from Mike to Janet - NESHAP Subpart W.msg

From: Lee, Raymond
Sent: Thursday, February 20, 2014 4:56 PM
To: Perrin, Alan
Cc: Peake, Tom; Rosnick, Reid
Subject: Note from Mike to Janet - NESHAP Subpart W

Hi Alan,

Here is the electronic version of the short note you asked me to put together. Running over a hard copy now.

Thanks,

Ray

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond@

Note to AA/Janet

Janet,

This package includes a Notice of Proposed Rulemaking that would revise "National Emission Standards for Operating Uranium Mill Tailings," Subpart W of 40 CFR part 61. With this action, the Agency would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities.

The Agency agreed to issue this proposed rulemaking through a settlement agreement with two groups: *Colorado Citizens Against Toxic Waste* and the *Rocky Mountain Clean Air Action*. The proposed action will add and refine definitions, as well as confirm its applicability to all facilities that manage uranium byproduct material/tailings, including conventional mills, in-situ leach facilities and heap leach piles. If finalized, the proposed rule would apply to 12 currently operating facilities. We anticipate mixed external reactions. State, local and tribal governments will likely be supportive. We expect industry groups will challenge our determinations on the applicability of Subpart W to evaporation ponds and heap leach piles. *Colorado Citizens Against Toxic Waste* is likely to express frustration that we are proposing a technology-based standard instead of numeric limits.

The notice's publication in the Federal Register begins a 90-day public comment period, and the rule along with additional information will be posted on our website (www.epa.gov/radiation). If you have any questions, please feel free to contact me or Reid Rosnick (202-343-9563), the workgroup chair on this action.

EPA-3087

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Fact Sheet (1).msg

- RE Fact Sheet (1).msg

From: Nesky, Anthony
Sent: Thursday, February 20, 2014 10:27 AM
To: Rosnick, Reid
Subject: RE: Fact Sheet
Importance: High

Word. See attached!

Were there any changes to the other communication materials? If so, could you point me to them when you get a chance. I want to ensure that are all working with the same files. Thanks! We will also need to work up a revised webpage for you.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
Sent: Thursday, February 20, 2014 6:50 AM
To: Nesky, Anthony
Subject: Fact Sheet

Good Morning Tony,

Any news on when we'll get the fact sheet? Thanks

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Revisions to National Emission Standards for Operating Uranium Mill Tailings

United States Environmental Protection Agency

Notice of Proposed Rulemaking

Limits on Air Pollution from Uranium Mill Tailings

EPA limits emissions of hazardous air pollutants under the authority of the Clean Air Act. EPA's "National Emission Standards for Hazardous Air Pollutants (NESHAPS)" (40 CFR Part 61) set limits on hazardous air pollutants from different activities and facilities. Subpart W of 40 CFR Part 61, "National Emission Standards for Operating Uranium Mill Tailings," limits radon emissions from tailings at operating uranium mills. EPA originally issued Subpart W in 1989 (54 FR 51703, December 15, 1989).

Current Standards for Uranium Mill Tailings

The Subpart W standards limit the radon releases and doses to the public from the normal operations of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores. The facilities are commonly known as uranium mills and the byproducts as tailings. Subpart W currently has different requirements for byproduct material impoundments built before 1989 and those built afterward. Pre-1989 impoundments are subject to a numeric limit on radon emissions. Post-1989 facilities must control radon limits through one of the two following work practices:

1. No more than two impoundments may operate at any time and each cannot be larger than 40 acres. Disposal of tailings takes place in phases.
2. Disposal of tailings takes place immediately, and no more than 10 acres of tailings may be uncovered at any time.

The Rulemaking Process: From Laws to Environmental Standards

An environmental law is enacted when Congress passes it and the President signs it. Specific laws make EPA responsible for writing regulations which specify what must be done to obey the law. Many environmental regulations set standards that limit the amount of a hazardous material that can be discharged into the environment.

After an environmental law is enacted, EPA conducts a scientific analysis of the issues and, if necessary, proposes new or revised regulations in a *Notice of Proposed Rulemaking (NPRM)*. The proposal is listed in the *Federal Register* so that members of the public can consider it and send their comments to us. EPA will consider the comments received as it finalizes the regulations. The comments and EPA's response to them become part of the public record.

Final regulations are published in the *Federal Register* as a *Final Rule*, and added to the *Code of Federal Regulations (CFR).*

How You Can Participate

The public will have 90 days to submit comments on this *Notice of Proposed Rulemaking* starting the day of its publication in the *Federal Register*. All submissions will become part of the official public record for this rulemaking. Be sure to identify your submission by Docket ID No. EPA–HQ–OAR–2008-0218. You can submit comments by email, by regular mail, online or in person. Detailed instructions for submission of comments are in the *Notice of Proposed Rulemaking (NPRM)*. A link to the text is provided at: www.epa.gov/radiation

Why Revise the Standards?

The Clean Air Act Amendments of 1990 require EPA to review the standards of Subpart W periodically. After completing a recent review, EPA concluded that revisions were needed to clarify definitions and to be more specific about what kind of tailings impoundments are subject to the standard. EPA also concluded that requirements for generally available control technology (GACT) or management practices are the best means to control radon emissions from tailings piles. GACT are commercially available methods, practices and techniques for operation and maintenance of emissions control systems.

Key Changes in the Proposed Rule

Definition of Uranium Recovery Facilities: The proposed rule would apply to all operating uranium recovery facilities, which are defined as those facilities that manage uranium byproduct material or tailings, including conventional uranium mills, in-situ leach recovery facilities, and heap leach facilities. "Operating" means that an impoundment is being used for the continued placement of uranium byproduct material or tailings, or is in standby status.

GACT for All Conventional Impoundments, Regardless of Age: In the proposed rule, EPA would no longer have different standards for impoundments constructed before and after 1989. EPA is proposing that the work practices for impoundments built after 1989 would be required as GACT at all conventional impoundments, regardless of their age. Studies of the work practices have shown that they are effective in controlling radon releases to the environment. EPA proposes dropping the numeric radon standard for pre-1989 facilities because it is not needed when the GACT controls are in place.

GACT for Non-Conventional Impoundments: "Non-conventional" impoundments (commonly known as evaporation or holding ponds) hold uranium byproduct materials in ponds that are covered by liquids. In this proposed rule, EPA would require control of radon emissions by covering the tailings in the ponds with at least one meter of liquid at all times.

GACT for Heap Leach Piles: EPA is proposing to require operating heap leach piles to maintain a moisture content of 30 percent at all times. Studies have shown that 30 percent moisture content keeps radon emissions from heap piles at acceptable levels.

Construction Requirements for All Impoundments: The current Subpart W standard references other regulations that require impoundments to be designed, constructed and installed in a way that protects adjacent soils and waters. Specifications include top and bottom liners as well as a leachate collection and removal system. In the proposed rule, these requirements would apply to all types of uranium recovery facilities.

Recordkeeping Requirements: Under the proposed rule, uranium recovery facilities would have to maintain records to demonstrate compliance with requirements for impoundment construction, liquid coverage of ponds, and moisture content of heap leach piles.

EPA and Uranium Extraction Operations

EPA's mission is to protect human health and natural resources from pollution. The Agency sets limits on the amount of radioactivity that can be released into the environment. EPA enforces the Clean Air Act requirements at Subpart W. The Nuclear Regulatory Commission (NRC) has regulatory responsibility for licensing and operation of uranium extraction facilities and other commercial facilities that use radioactive materials.

If enacted, this proposed rule would not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States.

Other Regulatory Agencies

U.S. Nuclear Regulatory Commission (NRC): The NRC regulates the civilian uses of nuclear materials in the United States by licensing facilities that possess, use or dispose of nuclear materials; establishing standards; and inspecting licensed facilities.

States: Most states have agencies responsible for regulating the use of radiation and radioactive emissions. Some states operate under agreement with the NRC to license and regulate certain types of radioactive materials.

EPA-3252

Reid Rosnick	To		
	cc		
	bcc		
	Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\Updated Subpart W Fact Sheet.msg	

- Updated Subpart W Fact Sheet.msg

From: Nesky, Anthony
Sent: Wednesday, February 19, 2014 12:58 PM
To: Rosnick, Reid
Cc: Peake, Tom
Subject: Updated Subpart W Fact Sheet
Importance: High

Dear Reid:

The updated Subpart W Fact Sheet is attached: it contains the corrected reference to 40 CFR Part 61 and Alan's addition of "Studies of the conventional work practices…."

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Revisions to National Emission Standards for Operating Uranium Mill Tailings

Notice of Proposed Rulemaking

Limits on Air Pollution from Uranium Mill Tailings

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1. No more than two impoundments may operate at any time and each cannot be larger than 40 acres. Disposal of tailings takes place in phases.
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GACT for Non-Conventional Impoundments: "Non-conventional" impoundments (commonly known as evaporation or holding ponds) hold uranium byproduct materials in ponds that are covered by liquids. In this proposed rule, EPA would require control of radon emissions by covering the tailings in the ponds with at least one meter of liquid at all times.

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Recordkeeping Requirements: Under the proposed rule, uranium recovery facilities would have to maintain records to demonstrate compliance with requirements for impoundment construction, liquid coverage of ponds, and moisture content of heap leach piles.

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If enacted, this proposed rule would not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States.

Other Regulatory Agencies

U.S. Nuclear Regulatory Commission (NRC): The NRC regulates the civilian uses of nuclear materials in the United States by licensing facilities that possess, use or dispose of nuclear materials; establishing standards; and inspecting licensed facilities.

States: Most states have agencies responsible for regulating the use of radiation and radioactive emissions. Some states operate under agreement with the NRC to license and regulate certain types of radioactive materials.

EPA-3086

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE EPA Subpart W Review Method 115 Report.msg

- RE EPA Subpart W Review Method 115 Report.msg

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Friday, February 07, 2014 2:08 PM
To: Rosnick, Reid
Cc: Peake, Tom
Subject: RE: EPA Subpart W Review: Method 115 Report

Dear Reid,

Thank you for your response. The questionable statement quoted below is that "no matter whether the moisture content is 6%, 30%, or even 60%, the radon flux will be about the same (NRC 1983)." This is not supported by the recent increase in the radon flux for Cell 2 at the White Mesa Mill as a result of dewatering. The concept of an overall moisture content in a tailings impoundment is inadequate, because, as tailings are dewatered, the moisture levels are not the same in all levels of the impoundment. In Cell 2, there are decreasing moisture

levels starting at the top. The reduction in moisture at the top of the cell caused an increase in the radon flux.

Therefore, the cell moisture levels directly influence the radon flux. This is why the White Mesa Annual Reports for 2012 and 2013 must be part of the Subpart W rulemaking record.

Sarah Fields
Uranium Watch

-------- Original Message --------
Subject: RE: EPA Subpart W Review: Method 115 Report
From: "Rosnick, Reid" <Rosnick.Reid@epa.gov>
Date: Fri, February 07, 2014 11:41 am
To: "sarah@uraniumwatch.org" <sarah@uraniumwatch.org>
Cc: "Peake, Tom" <Peake.Tom@epa.gov>

Hello Sarah,
I apologize for the length of time it has taken to respond to you. The process of moving the Subpart package up my management chain is an arduous one. The report you reference was intended to determine if Method 115 is still a valid test for determining radon flux from tailings piles. Secondarily, it evaluated what other methods using current technology may be employed to meet the emissions standard in lieu of dependence upon Method 115. The conclusion of the report was that the test method is still indeed valid.
The portion of the document you reference:
“The above performance standards depend in part on certain definitions, such as

dewatering, which is defined as removing moisture until the water content is less than 30% by weight. This definition can invoke other parameters, which can further influence radon flux from the tailings. For example, the radon flux from tailings with 6% moisture is actually 3.5 times that from tailings with 0.2% moisture (typical of the southwest)
and slowly increases to saturation (NRC 1983). Thus, no matter whether the moisture
content is 6%, 30%, or even 60%, the radon flux will be about the same (NRC 1983).
The 30% moisture definition appears somewhat arbitrary and does not really affect radon flux reduction considerations."

The main point of the paragraph is lost and for that I apologize. The authors are attempting to state that the process of limiting radon flux (the "performance standard" in the first sentence) is dependent on covering dewatered tailings with earthen materials as soon as possible. EPA recognizes that a tailings moisture content of approximately 30% (what the Agency considers "dewatered") will allow heavy equipment to move about the pile placing cover materials. Moisture contents above approximately 30% could damage equipment or the liner. Water is an effective barrier against radon emission. The last sentence is indeed out of place with the rest of the paragraph. A leap was made from setting a performance standard to incorrect commentary on the effectiveness of moisture content on tailings piles. I think that's what is confusing about the paragraph. I agree that it is poorly written, however, it does not take away from the overall conclusion of the document; Method 115 is still a valid test to determine radon flux at tailings piles. Therefore, I disagree with your determination that the document is either inadequate, contains misleading information or is not suitable to be included in the Subpart W review.

I'm sorry that you found it difficult to find one of the references to the document, but thank you for tracking it down. I will have it posted on the website soon.

Reid

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Wednesday, January 15, 2014 10:41 AM
To: Rosnick, Reid
Subject: EPA Subpart W Review: Method 115 Report

Dear Mr. Rosnick.

I am taking a look at what happens when a tailings impoundment dries out.
One of the Subpart W Review documents is a report requested by the EPA regarding
the methodology of measuring radon at the tailings piles (Method 115):
*REPORT ON THE REVIEW OF METHOD 115 TO MONITOR RADON EMISSIONS FROM URANIUM TAILING*S, Reid J. Rosnick, Work Assignment Manager, September 25, 2008.
http://www.epa.gov/radiation/docs/neshaps/subpart-w/method-115-compliance.pdf

The report was done over 5 years ago and is totally inadequate.

On pages 1 and 2 of the Report, it states re dewatering:

"The above performance standards depend in part on certain definitions, such as dewatering, which is defined as removing moisture until the water content is less than 30% by weight. This definition can invoke other parameters, which can further influence radon flux from the tailings. For example, the radon flux from tailings with 6% moisture is actually 3.5 times that from tailings with 0.2% moisture (typical of the southwest)
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content is 6%, 30%, or even 60%, the radon flux will be about the same (NRC 1983).
The 30% moisture definition appears somewhat arbitrary and does not really affect radon flux reduction considerations." The NRC document references:

NRC 1983. “Recommended Procedures for Measuring Radon Fluxes from Disposal Sites of
Residual Radioactive Materials,” NUREG/CR-3166, Young, Y.A., V.W. Thomas, and P.O. Jackson. March 1983.

This document is not in the current NRC NUREG Series Documents (http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/) and is not available on ADAMS.
Clearly, that 30-year old document is no longer considered relevant by the NRC and should not have been used as a reference in the current Subpart W rulemaking.

The EPA should have made sure that any document referenced in any of the reports or studies
contracted by the EPA for the Subpart W review were posted on the EPA website or readily available to
the public in electronic form elsewhere.

Obviously, the drying out of impoundments, as recently documented at White Mesa, increases the radon flux, and impoundments don't dry out all at once. It is a long process.

I suggest that you get copies of the 2012 Annual Radon Flux Report for the White Mesa Mill, and
the monthly reports (because they were out of compliance) since that time. The most recent
radon flux report was November 2013. These are important and relevant documents and are
available from the Utah Div. of Air Quality. Five-year old reports that rely on 30-year old
unavailable NRC records are inadequate.

The 2008 Report regarding Method 115 is out of date, inadequate, contains misleading information,
and should not be used to support the Subpart W rulemaking.

Please let me let me know when the NRC NUREG/CR-1366 has been placed on the EPA Subpart W Review
Website. You can get a copy from the NRC public document room, since it is on microfiche or a physical file.
NUREG-CR-3166:
Accession Number: 8304010671
Microform Addresses: 17824:086-17824:119
Physical File Location: PDR:NUREG--CR-3166-R-830331,PDR:NUREG//CR-3166 R 830331

Sincerely,

Sarah Fields
Uranium Watch
PO Box 344
Moab, Utah 84532
435-260-8384

EPA-3085

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE EPA Subpart W Review Method 115 Report (7).msg

- RE EPA Subpart W Review Method 115 Report (7).msg

From: Rosnick, Reid
Sent: Friday, February 07, 2014 1:41 PM
To: sarah@uraniumwatch.org
Cc: Peake, Tom
Subject: RE: EPA Subpart W Review: Method 115 Report

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Reid

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Wednesday, January 15, 2014 10:41 AM
To: Rosnick, Reid
Subject: EPA Subpart W Review: Method 115 Report

Dear Mr. Rosnick.

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Accession Number: 8304010671
Microform Addresses: 17824:086-17824:119
Physical File Location: PDR:NUREG--CR-3166-R-830331,PDR:NUREG//CR-3166 R 830331

Sincerely,

Sarah Fields
Uranium Watch
PO Box 344
Moab, Utah 84532
435-260-8384

EPA-3095

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Frequent spelling error in Subpart W title.msg

- RE Frequent spelling error in Subpart W title.msg

From: Nesky, Anthony
Sent: Tuesday, February 04, 2014 1:40 PM
To: Rosnick, Reid
Cc: Peake, Tom
Subject: RE: Frequent spelling error in Subpart W title

Here's the corrected fact sheet! For future reference, the latest version has dashes in the file name. I shall expunge the titularly erroneous versions from the server.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
Sent: Tuesday, February 04, 2014 10:41 AM
To: Nesky, Anthony
Subject: RE: Frequent spelling error in Subpart W title

I'll send the newest versions to you, except the fact sheet.

From: Nesky, Anthony
Sent: Tuesday, February 04, 2014 10:39 AM
To: Rosnick, Reid
Subject: RE: Frequent spelling error in Subpart W title

Also, where are you keeping your versions of the comm. Materials? I want to make sure we are working off the same files!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
Sent: Tuesday, February 04, 2014 8:11 AM
To: Peake, Tom; Nesky, Anthony
Subject: RE: Frequent spelling error in Subpart W title

Corrected, with the exception of the Fact Sheet. I do not have the Word version. Tony, can you help me out?

From: Peake, Tom
Sent: Monday, February 03, 2014 2:20 PM
To: Rosnick, Reid; Nesky, Anthony
Subject: Frequent spelling error in Subpart W title

Hi,

I have been reviewing the different pieces of the Subpart W package and I have identified an inconsistent spelling in the title of Subpart W across the different documents (including the fact sheet where it is used inconsistently) in the rule package, specifically the phrase “National Emission(s) Standard(s)”. Depending on the document there may be Emission or Emissions. I looked it up and it should be “Emission”. Likewise “Standard(s)” is inconsistently spelled. It should be “Standards”.

So, it is National Emission Standards.

The phrase appears to be spelled correctly in the preamble though I have not done a full scan of the document.

FYI, I have minor comments on most of the documents in the Subpart W package.

Tom Peake
US EPA Radiation Protection Division
Director, Center for Waste Management and Regulations
phone: 202-343-9765

Revisions to National Emission Standards for Operating Uranium Mill Tailings

United States Environmental Protection Agency

Notice of Proposed Rulemaking

Limits on Air Pollution from Uranium Mill Tailings

EPA limits emissions of hazardous air pollutants under the authority of the Clean Air Act. EPA's "National Emission Standards for Hazardous Air Pollutants (NESHAPS)" (40 Part CFR 61) set limits on hazardous air pollutants from different activities and facilities. Subpart W of 40 Part CFR 61, "National Emission Standards for Operating Uranium Mill Tailings," limits radon emissions from tailings at operating uranium mills. EPA originally issued Subpart W in 1989 (54 FR 51703, December 15, 1989).

Current Standards for Uranium Mill Tailings

The Subpart W standards limit the radon releases and doses to the public from the normal operations of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores. The facilities are commonly known as uranium mills and the byproducts as tailings. Subpart W currently has different requirements for impoundments built before 1989 and those built afterward. Pre-1989 impoundments are subject to a numeric limit on radon emissions. Post-1989 facilities must control radon limits through one of the two following work practices:

1. No more than two impoundments may operate at any time and they cannot be larger than 40 acres. Disposal of tailings takes place in phases.
2. Disposal of tailings takes place immediately, and no more than 10 acres of tailings may be uncovered at any time.

The Rulemaking Process: From Laws to Environmental Standards

An environmental law is enacted when Congress passes it and the President signs it. Specific laws make EPA responsible for writing regulations which specify what must be done to obey the law. Many environmental regulations set standards that limit the amount of a hazardous material that can be discharged into the environment.

After an environmental law is enacted, EPA conducts a scientific analysis of the issues and, if necessary, proposes new or revised regulations in a *Notice of Proposed Rulemaking (NPRM)*. The proposal is listed in the *Federal Register* so that members of the public can consider it and send their comments to us. EPA will consider the comments received as it finalizes the regulations. The comments and EPA's response to them become part of the public record.

Final regulations are published in the *Federal Register* as a *Final Rule*, and added to the *Code of Federal Regulations (CFR).*

How You Can Participate

The public will have 90 days to submit comments on this *Notice of Proposed Rulemaking* starting the day of its publication in the *Federal Register*. All submissions will become part of the official public record for this rulemaking. Be sure to identify your submission by Docket ID No. EPA–HQ–OAR–2008-0218. You can submit comments by email, by regular mail, online or in person. Detailed instructions for submission of comments are in the *Notice of Proposed Rulemaking (NPRM)*. A link to the text is provided at: www.epa.gov/radiation

United States Environmental Protection Agency | Office of Radiation and Indoor Air (6608J)

EPA 402-F-13-052 | February 2014
www.epa.gov/radiation

Why Revise the Standards?

The Clean Air Act Amendments of 1990 require EPA to review the standards of Subpart W periodically. After completing a recent review, EPA concluded that revisions were needed to clarify definitions and to be more specific about what kind of tailings impoundments are subject to the standard. EPA also concluded that requirements for generally available control technology (GACT) or management practices are the best means to control radon emissions from tailings piles. GACT are commercially available methods, practices and techniques for operation and maintenance of emissions control systems.

Key Changes in the Proposed Rule

Definition of Uranium Recovery Facilities: The proposed rule would apply to all operating uranium recovery facilities, which are defined as those facilities that manage uranium byproduct material or tailings, including conventional uranium mills, in-situ leach recovery facilities, and heap leach facilities. "Operating" means that an impoundment is being used for the continued placement of uranium byproduct material or tailings, or is in standby status.

GACT for All Conventional Impoundments, Regardless of Age: In the proposed rule, EPA would no longer have different standards for impoundments constructed before and after 1989. EPA is proposing that the work practices for impoundments built after 1989 would be required as GACT at all impoundments, regardless of their age. Studies of the work practices have shown that they are effective in controlling radon releases to the environment. EPA proposes dropping the numeric radon standard for pre-1989 facilities because it is not needed when the GACT controls are in place.

GACT for Non-Conventional Impoundments: "Non-conventional" impoundments (commonly known as evaporation or holding ponds) hold uranium byproduct materials in ponds that are covered by liquids. In this proposed rule, EPA would require control of radon emissions by covering the tailings in the ponds with at least one meter of liquid at all times.

GACT for Heap Leach Piles: EPA is proposing to require operating heap leach piles to maintain a moisture content of 30 percent at all times. Studies have shown that 30 percent moisture content keeps radon emissions from heap piles at acceptable levels.

Construction Requirements for All Impoundments: The current Subpart W standard references other regulations that require impoundments to be designed, constructed and installed in a way that protects adjacent soils and waters. Specifications include top and bottom liners as well as a leachate collection and removal system. In the proposed rule, these requirements would apply to all types of uranium recovery facilities.

Recordkeeping Requirements: Under the proposed rule, uranium recovery facilities would have to maintain records to demonstrate compliance with requirements for impoundment construction, liquid coverage of ponds, and moisture content of heap leach piles.

EPA and Uranium Extraction Operations

EPA's mission is to protect human health and natural resources from pollution. The Agency sets limits on the amount of radioactivity that can be released into the environment. EPA enforces the Clean Air Act requirements at Subpart W. The Nuclear Regulatory Commission (NRC) has regulatory responsibility for licensing and operation of uranium extraction facilities and other commercial facilities that use radioactive materials.

If enacted, this proposed rule would not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States.

Other Regulatory Agencies

U.S. Nuclear Regulatory Commission (NRC): The NRC regulates the civilian uses of nuclear materials in the United States by licensing facilities that possess, use or dispose of nuclear materials; establishing standards; and inspecting licensed facilities.

States: Most states have agencies responsible for regulating the use of radiation and radioactive emissions. Some states operate under agreement with the NRC to license and regulate certain types of radioactive materials.

EPA-3232

Reid Rosnick

To

cc

bcc

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- Subpart W Document NRC NUREG-CR-3166 is available online.msg

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Monday, February 03, 2014 6:40 PM
To: Rosnick, Reid
Subject: Subpart W Document: NRC NUREG-CR-3166 is available online

Dear Reid,

The 1983 NRC NUREG-/CR-3166 that was referenced in an EPA Subpart W report: *REPORT ON THE REVIEW OF METHOD 115 TO MONITOR RADON EMISSIONS FROM URANIUM TAILINGS,* Reid J. Rosnick, Work Assignment Manager, September 25, 2008.

NUREG-CR-3166 is available online from the Department of Energy's SciTech Connect database, at http://www.osti.gov/scitech/servlets/purl/1084229 .

Sarah Fields
Uranium Watch

EPA-3199

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Subpart W Review Documents.msg

- RE Subpart W Review Documents.msg

From: Rosnick, Reid
Sent: Wednesday, January 29, 2014 6:26 AM
To: 'sarah@uraniumwatch.org'
Subject: RE: Subpart W Review Documents

Dear Sarah,

I'm sorry I have not responded, I am in the process of moving the Subpart W proposal through our management chain so that it can be signed by the Administrator and printed in the Federal Register. As soon as I have the opportunity I will review your emails. Thank you for your patience.

Reid

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, January 28, 2014 2:21 PM
To: Rosnick, Reid
Subject: Subpart W Review Documents

Dear Reid,

Recently I sent you an e-mail requesting that an NRC document that was referenced in one of the EPA contractor reports be placed on the Subpart W review website. Please provide me with an update on the process.

Thank you,

Sarah Fields
Uranium Watch

EPA-3244

Reid Rosnick

To

cc

bcc

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- Subpart W Review Documents.msg

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Uranium Watch

EPA-3198

Reid Rosnick

To

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- RE Subpart W NPRM.msg

From: Rosnick, Reid
Sent: Wednesday, January 22, 2014 3:29 PM
To: Brozowski, George
Subject: RE: Subpart W NPRM

Gotcha. They should be very interested in CAP88 v.4. I know that DFOE has had positive comments during the testing phase.

Not much change. I still work from home every other day because of my back. The surgeon says I need more surgery, but I'm resisting.

From: Brozowski, George
Sent: Wednesday, January 22, 2014 3:10 PM
To: Rosnick, Reid
Subject: RE: Subpart W NPRM

Thanks and the LANL part was per CAP88.

How are you?

George P. Brozowski | 214-665-8541

From: Rosnick, Reid
Sent: Wednesday, January 22, 2014 2:01 PM
To: Brozowski, George
Subject: RE: Subpart W NPRM

Hi George,

NPRM is Notice of Proposed Rulemaking. This should have no effect for LANL, they don't mine or process uranium.

Reid

From: Brozowski, George
Sent: Wednesday, January 22, 2014 2:46 PM
To: Rosnick, Reid
Subject: RE: Subpart W NPRM

Good afternoon and belated Happy New Year! Hope your back is better!

Thanks for the update. One question; what does NPRM stand for? I sent your message out and folks (including me) want to know. LANL will run this with the older version for comparison.

Take care!

George P. Brozowski | 214-665-8541

From: Rosnick, Reid
Sent: Wednesday, January 22, 2014 8:30 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis
Subject: Subpart W NPRM

Hello All,

It has been a long time since my last status update. The reason for that is that nothing happened to Subpart W for quite some time. However, things are moving again and I have good news. The NRPM went through OMB relatively unscathed, with just some minor wordsmithing. I am now putting the package together for the Administrator's signature. We hope to have the rule in the FR in early February. I'll keep you posted.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3196

Reid Rosnick

To

cc

bcc

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- RE Subpart W NPRM (12).msg

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To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis
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Reid

____

Reid J. Rosnick
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Radiation Protection Division

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rosnick.reid@epa.gov

EPA-3024

Reid Rosnick

To

cc

bcc

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- General agenda items to send to NRC.msg

From: Peake, Tom
Sent: Thursday, January 16, 2014 12:12 PM
To: Gillam, Connie; Edwards, Jonathan; Perrin, Alan
Cc: Schultheisz, Daniel; Forinash, Betsy; Cherepy, Andrea; Rosnick, Reid; Littleton, Brian; Czyscinski, Kenneth
Subject: General agenda items to send to NRC

Connie,
I have revised the topic list I sent previously to be in a form that you can send to NRC. We will have other topics (e.g., OMB review) to discuss but not on the agenda we send.
Tom

Brian Holian
Introductions
EPA
Status of 40 CFR 192 (uranium mill tailings standards)
Status of 40 CFR 61, Subpart W (radon emissions from uranium tailings)
Low activity waste

Possible NRC topics
10 CFR 61 update
NRC's transition to ICRP 103
Other?

Cathy Haney
Introductions
EPA
40 CFR 190 ANPR status, plans
SNF/HLW waste issues
Addressing recent court order (writ of mandamus)
Follow-up to BRC/DOE strategy
Legislation

Possible NRC topic
Waste confidence status
Other?

EPA-2919

Reid Rosnick

To

cc

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Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\docket report.msg

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From: Miller, Beth
Sent: Wednesday, January 15, 2014 11:40 AM
To: Rosnick, Reid
Subject: docket report

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

Document Search Results

Docket Id	Document Id
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-DRAFT-
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-DRAFT-
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Title	Date Received
Surface Water Hydrology Considerations in predicting radon releases from water-covered areas of uranium tailings ponds	11/17/2009
Radon releases from Austrailian uranium mining and millng projects: assessing the UNSCEAR approach	11/17/2009
Minutes from December 3, 2009 stake holder conference call	1/4/2012
Minutes from January 5, 2010 conference call	1/4/2012
Minutes from April 6, 2010 stakeholders conference call	1/4/2012
Minutes from July 6, 2010 stakeholders conference call	1/4/2012
Minutes from October 5, 2010 stakeholders conference call	1/4/2012
Minutes from January 5, 2011 stakeholders conference call	1/4/2012
Minutes from April 7, 2011 stakeholders conference call	1/4/2012
Minutes from July 7, 2011 stakeholders conference call	1/4/2012
Minutes from October 6, 2011 stakeholders conference call	1/4/2012
April 26, 2007 Notice of Intent to sue	1/4/2012
Civil Suit filed against USEPA for failure to review/revise Subpart W in a timely fashion	1/4/2012
History of NESHAPS and Subpart W Report 9/25/2008	1/4/2012
Tailings Impoundment Technologies Report 9/25/2008	1/4/2012
Review of Method 115 Report 9/25/2008	1/4/2012
Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida [EPA-520/5-85-029] January 1986	1/4/2012
Quality Assurance Project Plan (QAPP)	1/4/2012
2009 Settlement Agreement between EPA and Plaintiffs	1/4/2012
Letter to plaintiffs regarding settlement agreement on November 3, 2009	1/4/2012
Work Plan for Risk Assessments	1/5/2012
Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment for Lincoln Park/Cotter Uranium Mill	1/5/2012
Comments by Steven H. Brown, CHP, SENES Consultants Limited 11/7/2010	1/5/2012
NRC/NMA Uranium Recovery Workshop	1/5/2012
National Mining Association 2008	1/5/2012
Meeting material from presentation in Canon City, Colorado - June 30, 2009	1/5/2012
National Mining Association 2009	1/5/2012
Meeting material from presentation in Rapid City, South Dakota - October 1, 2009	1/5/2012
Notes from meeting with National Mining Association	1/5/2012
National Mining Association 2010	1/5/2012

NESHAP Subpart W Activities An Internet Webinar - National Webinar	1/5/2012
Tuba City Arizona Uranium Stakeholders	1/5/2012
Uranium Recovery Workshop April 29 - 30, 2008	1/5/2012
Uranium Recovery Workshop April 29 - 30, 2008	1/5/2012
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012
National Emission Standards for Hazardous Air Pollutants; Standards for Radionuclides April 6 1983 Proposed Rule	1/6/2012
Federal Register 40 CFR Part 61 192.32 a	1/6/2012
October 31, 1984 ANPR Radionuclides	1/9/2012
40 CFR Part 61 General Requirements	1/9/2012
Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings [EPA 520/1-86-009]	1/9/2012
National Emission Standards for Hazardous Air Pollutants (NESHAPs), Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings. September 24, 1986 Final Rule	1/9/2012
Draft Environmental Impact Statement (EIS) for Proposed NESHAPS for Radionuclides	1/9/2012
March 7, 1989 Proposed Rule, National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides	1/9/2012
Risk Assessment Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (1)	1/9/2012
Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (2)	1/9/2012
Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (3)	1/9/2012
December 15, 1989 Final Rule, National Emission Standards for Hazardous Air Pollutants; Radionuclides	1/9/2012
Method 115- Monitoring for Radon-222 Emissions	1/9/2012
Subpart T Rescission	1/9/2012
40 CFR Part 61 192.32 a Errata	1/9/2012
40 CFR Part 61 General Requirements Errata	1/9/2012
EPA Procedures for Determining Confidential Business Information	1/9/2012
October 17 2000 Errata	1/9/2012
NRC's In-Situ Leach Facility Standard Review Plan	1/9/2012
IAEA Uranium Mill Tailings Report	1/9/2012
USEPA Contract Number EP-D-05-002	1/9/2012
Letter to Angelique Diaz, USEPA from Frank Filas, Environmental Manager, Energy Fuels Resources Corporation on August 31, 2010	1/10/2012
Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility	1/10/2012
Evaporation Pond Design Report Pinon Ridge Project Montrose County, Colorado	1/10/2012
Letter to Energy Fuels Resources Corporation from Steven H. Brown, SENES Consultants Limited on August 30, 2010	1/10/2012

Raffinate Characterization Pinon Ridge Mill Montrose County, Colorado	1/10/2012
Section 114 Letters/Responses	1/13/2012
Comparison of CAP88 calculations from SC&A and the EPA web version of CAP88	1/26/2012
Sheep Mountain Uranium Project	2/7/2012
Status of Cell 3 at the White Mesa mill	2/7/2012
Construction of An Environmental Radon Monitoring System Using CR-39 Nuclear Track Detectors	4/18/2012
Letter from Kennecott Uranium Company to Mr. Reid Rosnick	5/2/2012
Surface Water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds	5/31/2012
Uranium Mill Tailings Radon Flux Calculations	5/31/2012
Radon Emissions from Tailings and Evaporation Ponds	5/31/2012
Minutes from January 5, 2012 Conference Call	5/31/2012
Minutes from April 5, 2012 Conference Call	5/31/2012
Colorado Citizens Against Toxic Waste (CCAT) Concerns about Cotter Uranium Mill	5/31/2012
November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings	5/31/2012
Risk Assessment Model Selection Methodology	5/31/2012
Minutes from July 5, 2012	7/29/2013
Minutes from October 4, 2012	7/29/2013
Minutes from January 3, 2013 conference call	7/29/2013
Minutes from April 3, 2013	7/29/2013
Minutes from July 11, 2013	7/29/2013
Experimental Determination of Radon Fluxes over Water	7/29/2013
Subpart W-EIA-BID	7/30/2013
Risk Assessment Revision for 40 CFR Part 61 Subpart W â€“	9/12/2013
Record of Communication, May 16, 2013	9/17/2013
Subpart W Stakeholders Conference Call of October 17, 2013	10/24/2013
Subpart W Stakeholders Conference Call of January 2, 2014	1/7/2014
Meeting presentation to Office of Management and Budget by members of the National Mining Association	1/9/2014
Subpart W Interagency comments under EOs 12866 and 13563	1/13/2014
OMB questions on BID EIA	1/13/2014
E.O. 12866 review - draft	1/13/2014

Phase	Type
Pending_Post	SUPPORTING & RELATED MATERIALS
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EPA-2926

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\EPA Subpart W Review Method 115 Report.msg

- EPA Subpart W Review Method 115 Report.msg

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Wednesday, January 15, 2014 10:41 AM
To: Rosnick, Reid
Subject: EPA Subpart W Review: Method 115 Report

Dear Mr. Rosnick.
I am taking a look at what happens when a tailings impoundment dries out.
One of the Subpart W Review documents is a report requested by the EPA regarding the methodology of measuring radon at the tailings piles (Method 115):
REPORT ON THE REVIEW OF METHOD 115 TO MONITOR RADON EMISSIONS FROM URANIUM TAILINGS, Reid J. Rosnick, Work Assignment Manager, September 25, 2008.
http://www.epa.gov/radiation/docs/neshaps/subpart-w/method-115-compliance.pdf

The report was done over 5 years ago and is totally inadequate.

On pages 1 and 2 of the Report, it states re dewatering:

"The above performance standards depend in part on certain definitions, such as dewatering, which is defined as removing moisture until the water content is less than 30% by weight. This definition can invoke other parameters, which can further influence radon flux from the tailings. For example, the radon flux from tailings with 6% moisture is actually 3.5 times that from tailings with 0.2% moisture (typical of the southwest)
and slowly increases to saturation (NRC 1983). Thus, no matter whether the moisture content is 6%, 30%, or even 60%, the radon flux will be about the same (NRC 1983). The 30% moisture definition appears somewhat arbitrary and does not really affect radon flux reduction considerations." The NRC document references:

NRC 1983. "Recommended Procedures for Measuring Radon Fluxes from Disposal Sites of Residual Radioactive Materials," NUREG/CR-3166, Young, Y.A., V.W. Thomas, and P.O. Jackson. March 1983.

This document is not in the current NRC NUREG Series Documents (http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/) and is not available on ADAMS.
Clearly, that 30-year old document is no longer considered relevant by the NRC and should not have been used as a reference in the current Subpart W rulemaking.

The EPA should have made sure that any document referenced in any of the reports or studies
contracted by the EPA for the Subpart W review were posted on the EPA website or readily available to
the public in electronic form elsewhere.

Obviously, the drying out of impoundments, as recently documented at White Mesa, increases the radon flux, and impoundments don't dry out all at once. It is a long process.

I suggest that you get copies of the 2012 Annual Radon Flux Report for the White Mesa Mill, and
the monthly reports (because they were out of compliance) since that time. The most recent radon flux report was November 2013. These are important and relevant documents and are
available from the Utah Div. of Air Quality. Five-year old reports that rely on 30-year old unavailable NRC records are inadequate.

The 2008 Report regarding Method 115 is out of date, inadequate, contains misleading information,
and should not be used to support the Subpart W rulemaking.

Please let me let me know when the NRC NUREG/CR-1366 has been placed on the EPA Subpart W Review
Website. You can get a copy from the NRC public document room, since it is on microfiche or a physical file.
NUREG-CR-3166:
Accession Number: 8304010671
Microform Addresses: 17824:086-17824:119
Physical File Location: PDR:NUREG--CR-3166-R-830331,PDR:NUREG//CR-3166 R 830331

Sincerely,

Sarah Fields
Uranium Watch
PO Box 344
Moab, Utah 84532
435-260-8384

EPA-3173

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE RIN 2060-AP26.msg

- RE RIN 2060-AP26.msg

From: Lee, Raymond
Sent: Monday, January 13, 2014 6:21 PM
To: Rosnick, Reid
Subject: RE: RIN 2060-AP26

I forgot to mention! Once we have Mike's signature on everything we'll need 3 hard copies of every piece (along with the originals) as well as a CD-RW with the electronic copies before we hand it over to OAR. There may be some changes before then so you can hold off on doing that until we get the final ORIA green light. ☺

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond@

From: Lee, Raymond
Sent: Monday, January 13, 2014 6:17 PM
To: Rosnick, Reid
Subject: RE: RIN 2060-AP26

Hi Reid,

Great news – finally OMB! Haha. In any case, you should go ahead and just put the pieces together in one package – the action memo, comm pieces, FR letter, typesetting request, as well as the clean final version of the FR notice/preamble/rule. I've left a routing slip on your chair as well to affix to the front. You can just put all them together in a couple of attached folders for routing, as we did with the OMB package. The process isn't really much different; there are just some tweaks in the pieces this time around.

Let me know if you have any questions!

Thanks,

Ray

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond@

From: Rosnick, Reid
Sent: Monday, January 13, 2014 11:38 AM
To: Lee, Raymond
Cc: Peake, Tom; Nesky, Anthony; Herrenbruck, Glenna
Subject: FW: RIN 2060-AP26
Importance: High

Hi Ray,

It looks like we've cleared OMB! I have a draft of the action memo with Tom, I believe Tony has the communications stuff going, so just let me know how you want to proceed to get the package on the way! Thanks

Reid

From: Higgins, Cortney [mailto:Cortney_Higgins@omb.eop.gov]
Sent: Monday, January 13, 2014 11:09 AM
To: Rosnick, Reid
Cc: Schultheisz, Daniel; Stahle, Susan; Peake, Tom; Elman, Barry; Owens, Nicole; Muellerleile, Caryn
Subject: RIN 2060-AP26

Hi Reid,
We have concluded review of RIN 2060-AP26, "National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review." Please let me know if you have any questions.

Regards,
Cortney

EPA-3171

Reid Rosnick

To

cc

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- RE RIN 2060-AP26 (1).msg

From: Lee, Raymond
Sent: Monday, January 13, 2014 6:17 PM
To: Rosnick, Reid
Subject: RE: RIN 2060-AP26

Hi Reid,

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Let me know if you have any questions!

Thanks,

Ray

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond@

From: Rosnick, Reid
Sent: Monday, January 13, 2014 11:38 AM
To: Lee, Raymond
Cc: Peake, Tom; Nesky, Anthony; Herrenbruck, Glenna
Subject: FW: RIN 2060-AP26
Importance: High

Hi Ray,

It looks like we've cleared OMB! I have a draft of the action memo with Tom, I believe Tony has the communications stuff going, so just let me know how you want to proceed to get the package on the way! Thanks

Reid

From: Higgins, Cortney [mailto:Cortney_Higgins@omb.eop.gov]
Sent: Monday, January 13, 2014 11:09 AM
To: Rosnick, Reid
Cc: Schultheisz, Daniel; Stahle, Susan; Peake, Tom; Elman, Barry; Owens, Nicole; Muellerleile, Caryn
Subject: RIN 2060-AP26

Hi Reid,

We have concluded review of RIN 2060-AP26, “National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review.” Please let me know if you have any questions.

Regards,
Cortney

EPA-3183

Reid Rosnick

To

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Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE Subpart W approved by OMB   Cabinet Report statement and updated roll-out plan attached .msg

- RE Subpart W approved by OMB   Cabinet Report statement and updated roll-out plan attached .msg

From: McMichael, Nate
Sent: Monday, January 13, 2014 3:56 PM
To: Nesky, Anthony
Cc: Rosnick, Reid; Herrenbruck, Glenna; Peake, Tom
Subject: RE: Subpart W approved by OMB: Cabinet Report statement and updated roll-out plan attached.

Thanks, Tony. I am passing the blurb along to the special assistants to be worked into the report.

____

Nate McMichael
US EPA Office of Air and Radiation
202-564-0382 (Office)
202-236-4176 (Cell)

From: Nesky, Anthony
Sent: Monday, January 13, 2014 2:46 PM
To: McMichael, Nate
Cc: Rosnick, Reid; Herrenbruck, Glenna; Peake, Tom
Subject: Subpart W approved by OMB: Cabinet Report statement and updated roll-out plan attached.

Dear Nate:

OMB has approved the issuance of Subpart W, so RPD will proceed to get signature. An updated roll-out plan is attached. Roll-out to the public will begin upon publication in the Federal Register.

Here's my suggested write-up for the Cabinet Report:

> EPA will propose revisions to the National Emission Standard for Hazardous Air Pollutants (NESHAP) limiting radon emissions from uranium mill tailings. The Agency agreed to issue this proposed rulemaking through a settlement agreement with two groups: *Colorado Citizens Against Toxic Waste* and the *Rocky Mountain Clean Air Action* . EPA will propose generally available control technology or management practices (GACT) for the area source category. The proposal adds and refines definitions, and clarifies that the rule applies to all uranium recovery facilities that manage uranium byproduct material or tailings, including conventional mills, in-situ leach facilities and heap leach piles. If finalized, the proposed rule would apply to 12 currently operating facilities. We anticipate mixed external reactions. State, local and tribal governments will likely be supportive. We expect industry groups will challenge our determinations on the applicability of Subpart W to evaporation ponds and heap leach piles. *Colorado Citizens Against Toxic Waste* is likely to express frustration that we are proposing a technology-based standard instead of numeric limits.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

EPA-2918

Reid Rosnick

To

cc

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- Docket Items.msg

From: Rosnick, Reid
Sent: Monday, January 13, 2014 1:08 PM
To: Miller, Beth
Subject: Docket Items

Beth,

Here are the three documents that address OMB/Interagency comments.

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

ENVIRONMENTAL PROTECTION AGENCY 6560-50-P

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-~~XXXX-X~~-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[insert date]**, 90 days after publication in the Federal Register.

Commented [RJR1]: OMB suggested 60 days but communications from stakeholders suggest they will ask for another 30 day extension.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What ~~S~~should I ~~C~~consider as I ~~P~~prepare ~~M~~my ~~C~~comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to

respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document

CAA – Clean Air Act
CAAA – Clean Air Act amendments of 1990
CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7 × 10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1 x 10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1 x 10^{-12} curie
Ra-226 - Radium-226
Rn-222 - Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing on [INSERT DATE DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held. If a public hearing is held, it will be held at…WILL BE ADDED LATER

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emissions Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112]." EPA promulgated 40 CFR Part 61, Subpart W, "National Emission Standards for Radon Emissions From Operating Mill Tailings," ("Subpart W") on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA ~~(Docket Reference)~~ (EPA-HQ-OAR-2008-0218-0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009 ~~(Docket reference)~~ (EPA-HQ-OAR-2008-0218-0019).

of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources. (~~REFERENCE~~EPA-HQ-OAR-2008-0218-0001, 0002)

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAP issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAP is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the

Commented [RJR2]: I will provide these sources when we submit to OMB. PROVIDED

OMB also asks: Are there any other HAPs that need to be considered? Response: We believe that radon is the only HAP emitted from the impoundments we regulate under Subpart W as we presently have no data that shows any other HAPs being emitted from these impoundments. We do not have data to determine whether HAP are emitted from other processes or structures at these facilities.

discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may have small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions ~~that~~ are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from ~~A~~any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include,

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have ~~already~~ been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5] ~~Its presence is of particular concern in confined areas (such as mines or homes),[6] but radon can also be a health risk in open spaces.~~

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the

[5] http://www.epa.gov/radon/risk_assessment.html

~~[6] http://www.epa.gov/radon/pdfs/citizensguide.pdf~~

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uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells which pump the solution to the surface. At the surface, the uranium is recovered in an ion exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as "acid" or "alkaline" systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper ~~pressure~~hydraulic gradient[7] within the wellfield. The amount of liquid held back is a function of

[7] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

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the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These pondsimpoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[8] With respect to the lixiviant reinjected into the wellfield, In addition, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in andor out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[9] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart since they are a potential source of radon emissions. After the ore body has been depleted,

[8] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.
[9] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

Commented [RJR3]: OMB would like to discuss whether the ponds are subject to RCRA or CWA.

The evaporation ponds are not subject to RCRA as long as the wastes contained in the ponds are generated solely from mineral extraction or beneficiation. We understand this is the case for the evaporation ponds at the uranium recovery facilities covered by subpart W. If, however, a facility adds other wastes to the evaporation ponds, the ponds could become subject to RCRA. RCRA applicability in these circumstances could only be determined on a case-by-case basis.

Whether the evaporation ponds at a particular uranium recovery facility are subject to the CWA depends on the facts of the particular situation. Impoundments can be jurisdictional under the CWA but that is a case-by-case determination. Similarly, whether a facility is discharging a regulated pollutant is also a case-by-case determination. Thus, EPA could only determine CWA applicability at a particular facility on a case-by-case basis.

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restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, Tthe restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[10] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

[10] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

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A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic linerpad of plastic, clay, or asphalt, with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).
B. An acidic solution is then sprayed[11] over the ore to dissolve the uranium it contains.
C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.
D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.
E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake[12].
F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium

[11] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.
[12] It is our understanding that either ion exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

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byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is ~~packed in 55-gallon drums to be~~ transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach ~~this type of~~ uranium extraction under Subpart W, in addition to~~.~~ conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The~~se~~ HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.[13]" Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR Part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to "new" impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number

[13] See 54 FR 51689

of impoundments, or the amount of tailings that may remain uncovered at any time. After December 15, 1989, 40 CFR 61.252(b) states that no new tailings impoundment can be built unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the ~~size~~area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and

Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest

practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[14]

F. How ~~D~~did ~~W~~we ~~G~~gather ~~I~~information for this ~~P~~proposed ~~R~~rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with

[14] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility.— These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[15] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with

[15] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[16] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their pre-1989 impoundments[17] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR Part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. ~~The company has placed as much tailings sands into it as possible at this time.~~ The company is now pumping any

[16] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[17] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future. (~~Reference~~EPA-HQ-OAR-2008-0218-0069) The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond~~Since it most likely~~ contains byproduct material, its HAP emissions are ~~is~~ also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard. (~~Reference~~EPA-HQ-OAR-2008-0218-0087)

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company. (~~Reference~~EPA-HQ-OAR-2008-0218-0087)

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches[18]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec ~~for the less than one acre surface area~~.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure. ~~A reclamation plan exists but is under revision as part of license renewal. Since the impoundments are in closure, the impoundments are not subject to Subpart W but instead are subject to the long-term closure and decommissioning requirements in their license issued by the state of Colorado, an NRC agreement State.~~

2. 1989-Present Conventional Mill Impoundments

[18] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989~~Subpart W was promulgated,~~ the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago~~, because of renewed interest in nuclear power,~~ the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the

Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[19] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper ~~pressure~~hydraulic gradient within the wellfield.[20] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 1~~2~~1 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years~~ (REFERENCE)~~[21].

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain

[19] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html
[20] The Alta Mesa operation uses deep well injection rather than evaporation ponds.
[21] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

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Formatted: Font: (Default) Courier New, No underline, Font color: Auto facility in Wyoming. ~~Titan Uranium~~Energy Fuels has announced its intent to submit a license application to the NRC in ~~mid 2012~~December 2013. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[22]

5. Flux Requirement versus ~~Work Practice Standards~~Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the ~~work practice standards~~ management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment

[22] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

Commented [RJR4]: OMB would like to discuss why these two questions were considered. We asked these two questions as part of our overall efforts to determine whether revisions were necessary (i.e. part of our effort to "review, and if necessary, revise" the standards). The statute does not mandate we ask these two particular questions. But as part of our efforts to determine whether a revision was necessary, these are logical questions to ask. We describe the statutory authorities we are working under in Sections II.A. and B. What we describe here is just part of that process.

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Formatted: Font: (Default) Courier New, 10 pt that uses any new or differentnovel technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication with Utah Department of Environmental Quality, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which in addition to requiring ground-water monitoring also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by endingremoving the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 20142, and the phased disposal work method will be used for the remaining cells.(REFERENCEPersonal communication with Utah Department of Environmental Quality, May 16, 2013, EPA-HQ-2008-0218-0081)) As a result, we find that at the time of promulgation of this proposed rule there would be no conventional impoundment designed or constructed before December 15, 1989, that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989, appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989. We ask for comment on this approach.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[23]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR Part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those

[23] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our Part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR Part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR Part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the Part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized "generic" sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[24] that has been placed in the docket (~~DOCKET REFERENCE~~EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had

[24] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250)

been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[25]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed forto be the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United

[25] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html

States (Eastern Generic).[26] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1 x 10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4 x 10^{-5}. In protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}). The analyses also estimated that the total

Commented [RJR5]: OMB asks "In what context(s) does EPA use this cutoff for radon cancer risk. Response below.

[26] There is a potential in the future for uranium recovery in areas like south-central Virginia.

cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer incidencefatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal (DOCKET REFERENCE)..[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements that we have identified are generally available for controlling radon emissions in a cost-effective manner and are not currently included in Subpart W. Specifically, we are proposing to require that non-

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

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conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

Commented [RJR6]: OMB asked for this paragraph to be removed. We would prefer to retain it. It is simply a summary paragraph, and we believe it sums up the section.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the Part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to ~~bring~~subject these older impoundments to~~under the umbrella of~~ the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporat~~e~~ion of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W as they are effective methods of containment of tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds.

These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying.(~~REFERENCE~~EPA-HQ-OAR-2008-0218-0087) It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels), at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it, along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the emission standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that

Commented [RJR7]: OMB asks "The evaluation of the effectiveness of the 30% moisture content of heap leach piles has a number of uncertainties (e.g., the heterogeneity of the water content and lack of measured effectiveness data) that seem to make it difficult to justify the absence of monitoring. Can EPA better justify why heap leach piles should not be monitored?

EPA response: With no facilities to use as a guide, EPA is proposing this method of compliance for heap leach piles. Since this is a proposed rule, we have asked for comment on this approach, as well as suggestions for other methods.

it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records will be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment[29]; for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments. (~~REFERENCE~~EPA-HQ-OAR-2008-0218-0088)

required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the must also submit an Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB) at the time this proposal is published in the Federal Register. See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in subpart W; however, we are proposing to include this record-keeping requirement in subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for
Proposed Recordkeeping Requirements
(Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*
Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We ~~invite~~request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (~~REFERENCE~~EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings[30]. Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are ~~as such we have~~ regulated ~~them~~ under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore after review of the available information and from the evidence we have examined we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT ~~S~~standards for ~~O~~operating ~~M~~mill ~~T~~tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources. (~~REFERENCE IMPOUNDMENT STUDY~~EPA-HQ-OAR-2008-0218-0015) The

Commented [RJR8]: OMB has asked for a copy of this document. It will be sent to them.

liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system.(~~REFERENCE IMPOUNDMENT STUDY~~ EPA-HQ-OAR-2008-0218-0015) For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (~~REFERENCE~~EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Commented [RJR9]: OMB asks, "Is this a total cost or per facility – please specify? If per facility, what are the estimated total cost?

~~Type of Impoundment~~	~~Average Cost ($Millions)~~
~~Conventional Impoundment~~	~~13.8~~
~~Nonconventional Impoundment~~	~~23.7~~
~~Heap Leach~~	~~15.3~~

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

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Based on the Table 2Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(~~REFERENCE~~EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (~~REFERENCE~~EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal.

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines have are sometimes termed "do nothing" or "business as usual" scenarios.

These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR Part40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry ~~asserts~~has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 93% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:			
	A	=	Radon attenuation factor (unit less)
	λ	=	Radon-222 decay constant (sec^{-1})
		=	2.1×10^{-6} sec^{-1}
	D	=	Radon diffusion coefficient (cm^2/sec)
		=	0.003 cm^2/sec in water
	d	=	Depth of water (cm)
		=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds," (EPA-HQ-OAR-2008-0218-0080).

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has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

Commented [RJR10]: OMB asks: "Could operators use surfactants or other substances to reduce evaporation and hence costs when process water is not available? Also, some evaporation reduction schemes employ water column mixing to decrease the temperature of the water at the surface. It seems like this practice would be problematic for reducing radon emissions."

Reply: The use of surfactants or other substances to reduce evaporation would defeat the purpose of an evaporation pond, so we have not included this in the analysis. It is reasonable to assume that when the facility is in operation there are significant amounts of water available (bled off from the well field withdrawal to maintain an effective hydraulic gradient) to release into the ponds. Also, we have done a detailed analysis of water column mixing, effects of wind and other physical processes in the determination of radon flux from evaporation ponds. This analysis is contained in the document *"Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions form Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds," EPA Docket number EPA-HQ-OAR-2008-0218-0080, which will be included in the submission to OMB.*

The most obvious source of water is what is known as "process water" from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. (~~REFERENCE~~EPA-HQ-OAR-2008-0218-0087) Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (~~REFERENCE~~EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30%

moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest. We ask for comment on this approach.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. a minimum of 100 sampling stations for measuring radon. We did not estimate costs for this method, as we concluded that the length of time required ~~to walk~~walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to ~~the acidic~~ potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2) (Titan 2011). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table ~~1~~3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR Part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term "standby" and how it relates to the operational phase of an impoundment;
- Amending the definition of "operation" of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase "as determined by the Nuclear Regulatory Commission" in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term "Standby"

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period.” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define “standby” as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Ddefinition of “Operation” for an conventional Iimpoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that “operation” means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement [which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W]. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not “new tailings.” The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the Part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part

40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07 and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the Part 192 standards through its licenses ~~under UMTRCA~~.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule. (~~DOCKET REFERENCE~~EPA-HQ-OAR-2008-0218-0087)

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 2Table 4 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2Table 4 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Commented [RJR11]: OMB requests: "Can you add a table of the cost/cost savings for each of the provisions and the total estimated costs of the proposed rule?

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Table 4: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the Table 2~~Table~~ 4, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an

ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen[36], we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids ~~ground water~~ leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into

Commented [RJR12]: OMB asked for this paragraph to be removed. We prefer to retain it, because we believe it is important to explain why these provisions in Subpart W do not impose an additional cost.

NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

Commented [RJR13]: OMB asked for this sentence to be removed. We prefer to retain it, because we believe it is important to explain why these provisions in Subpart W do not impose an additional cost.

~~Baseline costs (explained in Section IV.B) for liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.~~

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review.

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order."

Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean

Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/ or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR Part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments to OMB at the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date 30 days after publication in the Federal Register.]**. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district

with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with Part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time.

Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20pCi/sec/sq. meter.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the four companies that own conventional mills, two, Dennison Mines and Energy Fuels, are classified as small businesses using fewer than 500 employees as the classification criterion.

~~Denison Mines'~~Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For ~~Denison~~Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in Part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach (ISL) facilities and heap leach facilities. Currently, there are five operating ISLs and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISLs were built in conformance with Part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating IS~~R~~Ls. The operating ISRs are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating IS~~R~~Ls, three additional ISRs have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.;

Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranez Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranez Uranium Corp. are small businesses.

~~Twelve~~Eleven other IS~~R~~Ls have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and ~~Benavidas,~~ Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISLs, all will be constructed in conformance with Part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan has presented, the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as ~~Titan Uranium~~Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by ~~Titan Uranium~~Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
~~Lisa P. Jackson~~Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[AMENDEDNational Emissions Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[AMENDEDNational Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is revisedamended by revising amending one definition e and amended by adding new definitions in alphabetical orderh-m as follows:

§61.251 Definitions

* * * * *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

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(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

~~(l) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.~~

(~~m~~l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-

situ leach (or recovery) facility and a heap leach facility or pile.

(nm) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section Revise §61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following managementwork practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal ~~work~~management practice ~~standard~~ in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. Heap leach piles shall also comply with the requirements of 40 CFR 192.32(a)(1). The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

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§61.254 [Removed]

5. Section 61.254 is removed.

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6. ~~Revise~~ Section 61.255 is revised to read as follows:

§61.255 Recordkeeping Rrequirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

Below are OMB questions/comments on the TSD (EIA), and responses.

Global Comments

- EPA's Cancer Guidelines, which provide guidance on developing and using cancer risk assessments, state that the objective of analyzing epidemiological data is to develop a dose-response for cancer incidence. The Cancer Guidelines further state that, because survival rates vary with different types of cancer, it is good to adjust mortality figures to reflect the relationship between incidence and mortality. Has EPA done such an analysis for radon? If not, we'd like to understand the rationale for not doing such an analysis.

Response - In BEIR VI (NAS 1999), the National Academy of Sciences (NAS) has performed an analysis to determine the cancer relationship between incidence and mortality for radon. BEIR VI points out that the vast majority (98%) of the additional cancers from exposure to radon are expected to be in the lung. For 1994, the U.S. Department of Health and Human Services (DHHS) estimated that there were 172,000 cases of lung cancer, and 153,000 lung cancer fatalities (DHHS 1995). Because of the high fatality rate of lung cancer, NAS concluded that the radon cancer morbidity would only slightly (i.e., ~12%) exceed its mortality. EPA has relied on the NAS analysis in the past (e.g., EPA 2003).

In 2013, DHHS published additional lung cancer incidence and fatality data. For 2010, there were an estimated 220,690 cases of lung cancer and 158,248 deaths, giving a morbidity to mortality ratio of 1.39.

Footnotes were added in Section 1.3 and to Table 14, indicating that all risks are presented as mortality risks, if it is desired to estimate the morbidity risk, simply multiply the mortality risk by 1.39.

- Can EPA explain why the FGR 13 risk factor is the most appropriate factor to use? Is there anything more recent than this 1999 value?

Response - Since Federal Guidance Report 13 (FGR 13, EPA, 1999) was published in 1999, research into the risk from exposure to radiation has continued. Among the scientific documents that have been published since 1999, two of the most comprehensive are National Academy of Sciences' (NAS') BEIR VII report (NAS 2006) and the International Commission on Radiological Protection (ICRP's) Publication 103 (ICRP 2007). The EPA is aware these publications, as well as others, and continues to evaluate their impact on risk coefficients. In April, 2011, EPA published revised estimates of cancer incidence and mortality risks due to low doses of ionizing radiation for the U.S. population, as well as their scientific basis (EPA 2011). Prior to its publication, the EPA's Science Advisory Board (SAB) reviewed the draft (EPA 2010), and in the final report, the EPA took into account the recommendations made by SAB. The revised risk estimates will be applied to update the radionuclide risk coefficients in a revised FGR 13, however, it is anticipated to take at least two to three years to complete the FGR 13 revision (EPA 2013).
As the table below demonstrates, although the risk coefficients have evolved since 1999, their numerical values have not changes significantly during that time period, particularly the mortality risk coefficient, as the following statement from EPA 2011 shows: "In general, the new EPA

mortality estimates do not differ greatly from those in FGR-13; remarkably, for all sites combined, the estimates changed by less than 2% for both males and females."

	FGR-13 (1999)	BEIR VII (2006)	ICRP 103 (2007)	EPA (2011)
	(per Gy)	(per Gy)	(per Sv)	(per Gy)
Mortality	Table 7.3	Table ES-1	Table A.4-18	Table 3-18
Males	0.0462	0.041	0.0459	0.0469
Females	0.0683	0.061	0.0639	0.0689
Combined	0.0575	—	0.055	—
Morbidity	Table 7.6	Table ES-1	Table A.4-18	Table 3-17
Males	0.0651	0.08	0.156	0.0955
Females	0.103	0.13	0.183	0.135
Combined	0.0846	—	—	—

Specifically for radon and its progeny, ICRP Publication 115 (ICRP, 2010) recommended use a risk coefficient of 5×10^{-4} per Working Level Month (WLM), where WLM is an exposure from breathing air containing a specified concentration of short-lived radon progeny. Publication 115 goes on to state that the effective dose from inhalation of radon progeny ranges from about 10 to 20 mSv per WLM depending on the exposure scenario. When these two statements are combined together, the risk from radon and its progeny can be expressed as ranging from 0.025 to 0.05 Sv^{-1}. EPA 2011 was added as a reference and the following footnote was added to Section 4.2: Since FGR 13 was published, several organizations have produced updated radiation risk estimates. EPA 2011 reviewed the update risk estimates and concluded that the new mortality estimates do not differ greatly from those in FGR-13.

EPA (Environmental Protection Agency), 1999. "Cancer Risk Coefficients for Environmental Exposure to Radionuclides." Federal Guidance Report 13. EPA Report 402-R-99-001, Washington, DC: U.S. EPA.
EPA/SAB (Environmental Protection Agency, Science Advisory Board), 2010. "SAB Review of Draft 'EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population'." EPA-SAB-10-001, January 5, 2010.
EPA (Environmental Protection Agency), 2011. "Radiogenic Cancer Risk Models and Projections for the U.S. Population." EPA Report 402-R-11-001, Washington, DC: U.S. EPA. April 2011.
EPA (Environmental Protection Agency), 2013. "Blue Book: EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population." http://www.epa.gov/rpdweb00/assessment/ blue-book/. Updated: August 22, 2013. Accessed: September 23, 2013.
ICRP (International Commission on Radiological Protection), 2007. "The 2007 Recommendations of the International Commission on Radiological Protection." ICRP Publication 103. Ann. ICRP 37 (2-4).
ICRP (International Commission on Radiological Protection), 2010. "Lung Cancer Risk from Radon and Progeny and Statement on Radon." ICRP Publication 115, Ann. ICRP 40(1).
NAS (National Academy of Sciences), 2006. "Health Risks from Exposure to Low Levels of Ionizing Radiation. BEIR VII Phase 2." Washington, DC: National Academy Press.

- Comments sent to EPA on 7/18 also apply to this document. Therefore, we request that EPA make changes to this document as appropriate to address the comments sent on 7/18.

Acknowledged

- EPA is proposing to regulate the heap leach extraction process. As EPA appropriately described, the heap leach treatment processes uranium ore in such a manner that the uranium content is removed. Licensing and regulatory authority over this process rests with the NRC pursuant to the Atomic Energy Act (AEA).

Please see our response to this question in Interagency Comments Under EOs 13563 and 12866 on NESHAP Subpart W NPRM

- We recommend that EPA update its cost impact analysis and technical basis to accurately reflect the decreasing trend in the uranium market price. For example, EPA anticipates that the market value of uranium will be approximately $65, whereas the actual market value is less than $40.

Response - The cost and economic impact estimates described in Section 6.2 and 6.3 are based on industry data compiled in 2010-2011. Therefore, some of the analytical input values would differ somewhat if they were updated to reflect the latest information available. For example, the current long-term market price of uranium is approximately 17 percent lower than the $65 estimate that is used in the analysis (Cameco, 2013). The uranium mining industry is currently experiencing a volatile period resulting from the aftereffects of the Fukushima nuclear disaster. In particular, uranium demand has suffered from nearly all of Japan's workable reactors remaining offline since the March 2011 earthquake and tsunami triggered multiple meltdowns at the Fukushima Dai-ichi plant. Given the atypical post-Fukushima uranium market situation of the last couple of years and the prospects for a return to more normal market activity in the mid-term future,[1] we have decided not to update the analysis to incorporate the latest industry data. The results of the analyses described in this section are judged to be realistic estimates of the mid- to long-term impacts of the proposed Subpart W NESHAP.

<u>Specific Comments</u>

- Page 5 of the TSD: Please clarify the statement that an emission limit is not necessary to protect public health?

Response - This statement has been expanded and revised as follows: By requiring that conventional impoundments be designed, constructed, and operated to meet one of two 40 CFR 61.252(b) work practices (i.e., phased disposal and continuous disposal), adoption of an emission limit (e.g., 20 pCi/(m^2-sec)) is not necessary to protect public health.

- Page 34 states "[a]dditionally, moving to seven-spot patterns versus five-spot patterns greatly increased the control of mobilized solutions and the metals that they contained." The NRC's experience in Wyoming has been that licensees generally use five-spot patterns, and they've seen very little use of seven-spot patterns. If this statement on page 34 is based on operations in Texas, that aspect should be included.

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[1]These prospects include: the conclusion of the U.S.-Russia program that annually removes 24 million pounds of ex-military highly enriched uranium from the market via down-blending for use as U.S. nuclear fuel; the 60 nuclear power plants that are currently under construction throughout the world; efforts to reduce climate change emissions; and expectations that Japan will slowly begin restarting its 50 nuclear plants.

Response - The statement was based on information provided in the Irigaray Project Environmental Report (WMC 1977) and Final Environmental Statement (NRC 1978). Both documents state that five-spot and seven-spot well patterns were tested at Irigaray, Johnson County, Wyoming, in 1975 and 1977, respectively. Based on this testing, it was concluded that "Because of limited injection flows and economic considerations, the adopted well configuration for the proposed plant and probably for future Irigaray mine sites is the seven spot pattern" (WMC 1977, page 18). However, in response to OMB's comment, further research showed that "These [seven-spot] patterns were later converted to five-spot patterns during operations in the 1980's and 1990's. Future development at Irigaray and Christensen Ranch will use a combination of [five- and seven-spot] patterns." (COMIN 1996, page 3-8) This, plus the NRC's recent Wyoming experience (as pointed out by OMB), shows that there is no longer a basis for the above statement. Consequently, that sentence has been deleted.

COMIN (COGEMA Mining, Inc.) 1996, "Submittal of Supplemental Information for the Renewal of Source Material License SUA-1341, Irigaray and Christensen Ranch Sites and Request for Performance Based License," January 5, 1996.

NRC (U.S. Nuclear Regulatory Commission) 1978, "Final Environmental Statement Related to the Wyoming Mineral Corporation, Irigaray Uranium Solution Mining Project (Johnson County, Wyoming)," Docket No. 40-8502, NUREG-0481, September 1978.

WMC (Wyoming Mineral Corporation) 1977, "Environmental Report, Irigaray Project, Johnson County, Wyoming," July 29, 1977.

- Table 9 on page 36 is not correct. For example, in this table, EPA identifies Hydro Resources as an operating facility. Hydro Resources has a license, but no construction activities have occurred at the site and the site is not operational. This table also omits operating facilities (e.g., Uranium One Willow Creek and Christensen Ranch). We recommend that EPA verify this information with Texas.

Response - On August 7, 2013, the Energy Information Administration released 2013 2nd quarter data on the In-Situ-Leach Plant Owner, Plant Name, County and State locations, and Development/Operating Status. Table 9 and Table 10 have been revised to reflect this EIA data. The text was also revised to be consistent with the tables. The EIS report was added to the list of references.

- Table 10 on page 36 is not correct. For example, the ownership information for Christensen Ranch is incorrect. The current owner for Christensen Ranch is Uranium One and the facility has been operating since late 2010 / early 2011. Uranium One Moore Ranch was licensed in late 2010 and thus doesn't fit within the category of facilities listed in Table 10. Also, the NRC is no longer expecting an application for Wildhorse Energy West Alkalai Creek.

Response - On August 7, 2013, the Energy Information Administration released 2013 2nd quarter data on the In-Situ-Leach Plant Owner, Plant Name, County and State locations, and Development/Operating Status. Table 9 and Table 10 have been revised to reflect this EIA data.

The text was also revised to be consistent with the tables. The EIS report was added to the list of references.

- On page 40, EPA identified Homestake as an ISL facility. Homestake operated as a conventional uranium mill and uses evaporation ponds to dispose of liquid byproduct material. Homestake is in the process of decommissioning.

Response - Agreed, "Homestake ISL facility" changed to "Homestake Uranium Mill Site ," as it is referred to in Baker and Cox, 2010.

- We recommend that page 42 be revised because solvent extraction can also be used to heap-leach uranium ore, depending on ore grade; a similar comment was made on the draft proposed rule.

Response - Figure 11 has been replaced with simpler, clearer, more generic depiction of the heap leach process, from NUREG-1350, Volume 25. The 5 step description of the heap leach process that appears above Figure 11 was also changed to be more consistent with the description provided in NUREG-1350. NUREG-1350 was added to the list of references.

- The second sentence of footnote 6 on page 92 should be deleted because it is not accurate. Congress did not enact the subject legislative language for the reason mentioned. Further, this language is extraneous to this issue at hand.

Response - Sentence deleted from footnote 6.

Global Comments

1. **EPA appears to be extending its authority into implementation of the 40 CFR Part 192 standards, which oversteps its authority under the Atomic Energy Act (AEA).** The AEA confers jurisdiction over the operations of conventional, heap leach, and in situ uranium recovery facilities where source material is milled or processed on the U.S. Nuclear Regulatory Commission (NRC). As discussed in Section 275(b) of the AEA, the Uranium Mill Tailings and Radiation Control Act of 1978 (UMTRCA) amended the AEA to give EPA the authority to develop generally applicable standards for protection of public health, safety, and the environment from the radiological and non-radiological hazards associated with processing and with the possession, transfer, and disposal of byproduct material at sites where ore is processed primarily for its source material content or at site which are used for the disposal of such byproduct material. EPA's generally applicable standards are contained in 40 CFR Part 192. Section 275(d) states that "[i]mplementation and enforcement of the standards promulgated pursuant to subsection b. of this section shall be the responsibility of the [NRC] in the conduct of its licensing activities under this Act." Section 84 of the AEA directs the NRC to develop standards that conform to EPA's general standards. The NRC's conforming standards are contained in 10 CFR Part 40, Appendix A.

   Throughout the revisions to 40 CFR Part 61 in this draft proposed rule, EPA proposes that it will be responsible for ensuring that liner requirements under 40 CFR 192.32 are met. We interpret that the following statements would authorize EPA to review and approve liner system designs for impoundments at uranium recovery facilities and would be duplicative of and create a conflict between the NRC's implementation of EPA's generally applicable standards and the proposed regulations: "[t]hird, we are proposing to clarify what specific liner requirements in 40 CFR 192.32 apply and that EPA, rather than NRC, will ensure those requirements are met under subpart W." (page 48 – 49); and "[h]owever, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority." (page 97)(note that several other locations within the document, such as pages 71, 72, 74, 96, and 97, discuss the relationship between the 40 CFR Part 192 standards and 10 CFR Part 40, Appendix A, requirements). However, statements on pages 74, 98, and 107 of the proposed revisions correctly point out that the 40 CFR Part 192 standards are currently implemented and enforced by the NRC. It is unclear to us what additional benefit would be obtained by implementing the 40 CFR Part 192 standards under the CAA as uranium recovery facilities are already subjected to these standards. The NRC's conforming regulations in 10 CFR Part 40, Appendix A, currently require installation of liner systems to protect groundwater resources in the vicinity of an impoundment. Additionally, the aspect of the proposed rule requiring both NRC and EPA implementation of the 40 CFR Part 192 standards may lead to more confusion because while NRC's 10 CFR Part 40, Appendix A, standards conform to the 40 CFR Part 192 standards (including the cross reference to 40 CFR 264), the Appendix A standards are not identical to the 40 CFR Part 192 standards. Note the NRC's final rulemaking related to the development of groundwater protection standards for uranium recovery facilities (52 FR 43553; November 13, 1987) includes a table identifying the applicable EPA regulation, subject, and location of the comparable NRC regulation in Appendix A.

EPA Response: EPA agrees that under UMTRCA, it has the authority to promulgate standards applicable to uranium recovery facilities, and NRC has the authority to implement and enforce these standards through its licensing activities. *See* 42 U.S.C. §§ 2022(b), 2022(d); 40 CFR Part 192. However, as explained in Sections II.A. and II.B. of the Subpart W proposed rule, EPA also has authority under the Clean Air Act (CAA) to regulate the emissions of radionuclides from these same facilities. EPA originally promulgated 40 CFR Part 61, Subpart W, in 1989 under its CAA section 112 authority, and it is under that authority that EPA now acts to propose revisions to Subpart W.

EPA's authority under the CAA includes the authority to implement and enforce the standards it promulgates. Subpart W, as promulgated in 1989, requires uranium recovery facilities to comply with certain Part 192 requirements. Specifically, Subpart W currently requires: "All mill owners or operators shall comply with the provisions of 40 CFR 192.32(a) in the operation of tailings piles, the exemption for existing piles in 40 CFR 192.32(a) notwithstanding." 40 CFR 61.252(c); *see also* discussion in Section II.E. of proposed rule. The fact that EPA cross-references the Part 192 requirements in Subpart W does not change the authority EPA is acting under when requiring compliance with these requirements. EPA is acting under the CAA when it includes these Part 192 requirements in Subpart W. Cross-referencing these provisions instead of copying them directly into Subpart W is done as a matter of convenience and is a convention often used in rulemakings. The proposed revisions clarify the particular Part 192 requirements that apply to uranium recovery facilities under Subpart W.

EPA does not believe that its proposed revisions to Subpart W will lead to confusion as to the requirements that uranium recovery facilities must meet. The proposed revisions to Subpart W simply clarify the particular Part 192 requirements that apply. The proposed revisions also propose that uranium recovery facilities keep records that confirm that the conventional impoundments, nonconventional impoundments and heap leach piles meet the requirements in 40 CFR 192.32(a)(1), which we have incorporated by reference into Subpart W. *See* 40 CFR 61.255(a) in the proposed rule. These recordkeeping requirements help assure compliance with the requirements of Subpart W. If we adopt the proposed recordkeeping requirements in Subpart W, EPA expects that most facilities will demonstrate compliance with the Part 192 requirements in Subpart W by showing compliance with the same requirements for NRC purposes. The recordkeeping requirements included in the proposed rule are not burdensome and enable EPA to assure compliance with the requirements of Subpart W. As has been the case since 1989, EPA can take enforcement action if necessary under its CAA regulatory authority if the requirements of Subpart W are not met.

2. **EPA lacks the authority to assume jurisdiction over heap leach uranium recovery operations.** On page 23 of the proposed rule, EPA states that it is proposing to regulate heap leach uranium extraction under Subpart W. As EPA appropriately described, the heap leach treatment processes uranium ore in such a manner that the uranium content is removed. Licensing and regulatory authority over this process rest with the NRC pursuant to the AEA.

   EPA Response: We disagree that EPA lacks the authority to regulate radon emissions from the heap leach pile under the CAA. See discussion in Section IV.B.4 of the proposed rule. While we agree that NRC possesses the licensing authority pursuant to the AEA, EPA has authority under the CAA to regulate radon emissions generated from the uranium byproduct material in the heap leach pile, and we are exercising that authority in the proposed rule. Regulating radon emissions from heap leach piles is no different than regulating radon emissions from uranium byproduct material in conventional tailings impoundments or evaporation ponds. As discussed in Section IV.B.4 of the proposed rule, EPA believes that once the extraction solution removes uranium from the ore, what remains is uranium byproduct material; thus, under the CAA, EPA may require such facilities to limit radon emissions from the heap leach pile.

3. **Various definitions may not be consistent with other regulations or used consistently within the proposed rule and could lead to confusion.** The AEA, UMTRCA, 40 CFR Part 192, and 10 CFR Part 40 all define byproduct material as "[t]he tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content." However, Subpart W defines uranium byproduct material or tailings as the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Under the Subpart W definition, all byproduct material are tailings, which is a different from the approach taken in the AEA, UMTRCA, 40 CFR Part 192, and 10 CFR Part 40. Our interpretation under the AEA, UMTRCA, 40 CFR Part 192, and 10 CFR Part 40 is that tailings are merely one type of byproduct material. In addition to using a different definition, the proposed rule revisions do not appear to use the terms "byproduct material" and "tailings" consistently. For example, page 18 of the document discusses evaporation or holding ponds that contain byproduct material, page 49 discusses ponds that contain tailings (but the material is liquid byproduct material), and page 53 uses both terms "byproduct material" and "tailings" in the title and following paragraph. We also observe that the proposed rule uses several different terms when referring to structures that contain byproduct material (impoundment, mill tailings pile, evaporation pond, holding pond, heap leach pile, tailings impoundment, collection pond, non-conventional impoundment). We agree that it does not particularly matter what the structure is called; however, it may be helpful to identify and define one term near the beginning of the proposed rule and use it consistently throughout the document. We observe that the definition of a surface impoundment in 10 CFR Part 40, Appendix A, may be an appropriate term to use.

   EPA Response: The various definitions for impoundments in the proposed rule were defined specifically to avoid confusion among the owners and operators of uranium recovery facilities. Many have argued that Subpart W did not apply to evaporation ponds because they did not hold "tailings." However, by defining "uranium byproduct material or tailings" in the original Subpart W final rule (see 40 CFR 61.251(g)), as well as proposing definitions for the types of pits, ponds or impoundments that hold the uranium byproduct material or tailings (see the proposed definitions of these terms in 40 CFR 61.251), we believe operators understand whether they fall under the regulatory umbrella of Subpart W. We attempted to maintain consistency with the definition of impoundment as found in the RCRA program, and by reference, under EPA's definitions in 40 CFR Part 192.

4. **Concern about timing as to when Subpart W would apply.** On page 86 of the proposed rule, EPA states its intention to have Subpart W apply as soon as lixiviant is placed on a heap leach pile. This approach may lead to challenges from an operational standpoint. Based on discussions with potential operators, we understand that lixiviant may be applied on different portions of a heap pile at different times, which would allow a portion of the pile to drain. Additionally, an operator may propose to place ore in multiple lifts of material, so it may be possible to end up with a situation where material not yet subject to Subpart W overlies material subject to Subpart W. From a regulatory compliance perspective, it may be more practical to follow the approach proposed on pages 91 and 92. Under this approach, Subpart W would apply after the final rinse of a heap leach pile is complete. Note that the definition of tailings in UMTRCA and 40 CFR Part 192 is "[t]he remaining portion of a metal-bearing ore after some or all of such metal, such as uranium, has been extracted." We observe that under this definition, ore is considered to be tailings after the uranium has been extracted, not when it is in the process of being extracted.

   EPA Response: EPA agrees that there may be comments on our interpretation of when material in the heap leach pile becomes subject to the requirements of Subpart W. It is important to note that since this is a proposed rule, we specifically laid out several options for regulation of the byproduct material in a heap leach pile. Our preferred option is to require regulation of the heap as soon as the material in the heap contains uranium byproduct material. We recognize, however, that some commenters may disagree with this approach, and argue that the material only becomes a waste when it is no longer used for the purpose for which it was intended. EPA will carefully consider all comments before making a determination in the final rule.

5. **Concern about the 30 percent moisture content requirement for heap leach piles.** EPA is proposing that heap leach piles maintain a minimum moisture content of at least 30 percent to minimize radon emissions. We have several comments related to this proposed requirement:

   General EPA Response: There are a few general stipulations that are common to all of the responses below. They are summarized here.

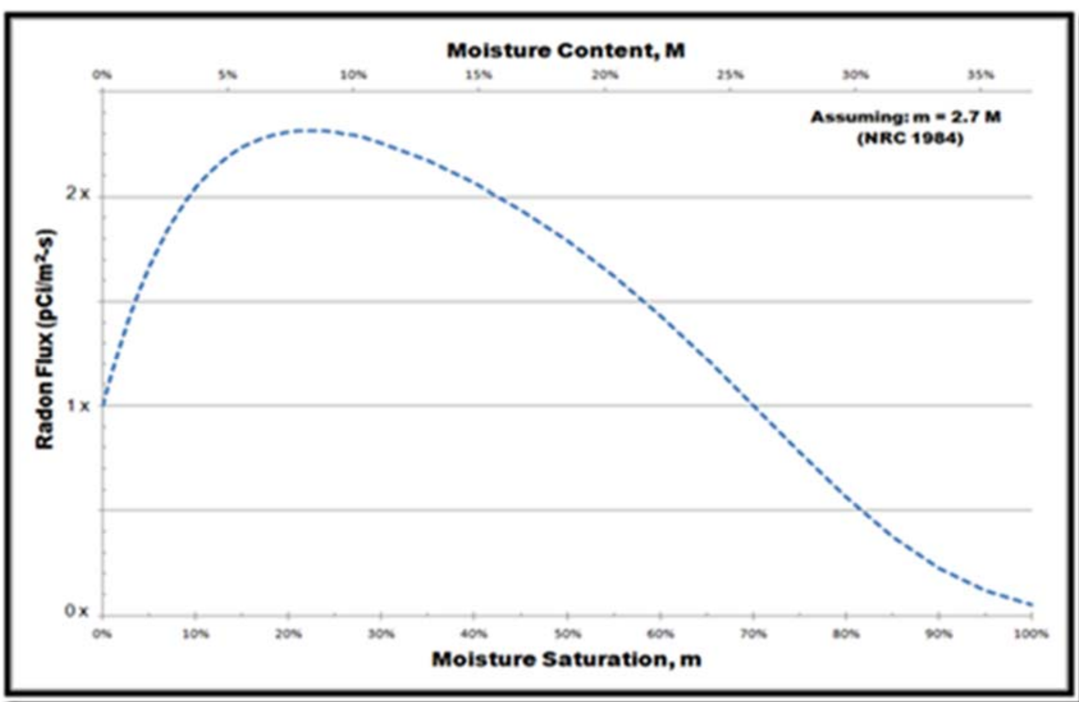
   First, it is important to understand that the basis for applying the 30% moisture content requirement to a specific heap leach pile is very much dependent on the characteristics of the pile itself. Some of the pile's characteristics that might influence the application of the requirement include the topography of the site, the site's net evaporation rate, the pile's height, the ore's initial moisture content, permeability of ore, etc. Because of this dependency, each site will be affected differently by the 30% moisture content GACT, making it difficult to provide generic responses to some of the comments.

   Second, it is recognized that imposing a 30% moisture content requirement on the pile might (and likely, would) require certain design changes to the pile (e.g., lower slopes, higher liquid application rates, additional monitoring, etc.). Nonetheless, as described in the specific responses, it is believed that successful designs can be developed.

   Finally, it may be feasible that for some piles, the 30% moisture content requirement could be applied in a stepped manner. For example, the 30% moisture content might only be applied to the top "×" feet of the pile, where "×" feet would be determined on a site by site basis. Or, if there are inter-lift liners in a multi-lift pile, the 30% moisture content requirement might only apply to the top lift.

- **Comment:** EPA should provide an objective, or goal, for radon emissions at heap leach piles. This would allow potential commenters to compare the reduction afforded by the 30 percent moisture content criterion. Without a goal or objective, it is unclear how EPA will judge any information submitted, and no basis is given for people to supply the further information that is requested. The reduction factor is a critical factor in assessing the risk from radon emissions from a heap leach pile. It is not clear if there is any data available (either actual data or modeling) demonstrating that a 30 percent moisture content requirement provides sufficient reduction in radon emissions.

EPA Response: The goal of the 30% moisture content requirement is not so much to reduce the radon flux, as it is to prevent the flux from increasing. When moisture is introduced the radon flux first increases due to an increasing emanation (diffusion) coefficient and then, as more moisture is applied, the radon flux decreases due to the reduced diffusion coefficient. The figure below shows that the radon flux is a maximum at about 8% moisture content, and that at 30% moisture content the flux is back below what it is for dry ore. In other words, since the heap leaching process intentionally introduces moisture to the ore and since that moisture can result in an increased radon flux, the 30% moisture requirement is an attempt to ensure that heap leaching will not enhance the release of radon over what would occur from the dry ore.



Therefore, the objective or goal of this GACT is to maintain the radon flux during the heap leach process at or below the flux from dry ore.

We have not being able to identify, so far, “actual” data associated with radon emissions from a heap leach operation. There were a couple of novice attempts at heap leaching in the 1980's in the Gas Hills of Wyoming. These piles were composed of low-grade ore and overburden that was saturated with an acidic leaching solution. The resulting uranium rich solution was recovered and processed. There were no licensing conditions requiring radon emission measurements (to our knowledge) associated with this specific operation. Rather track-etch canisters were placed a strategic down-wind points. The continuous and sometimes violent winds in this area of Wyoming caused sufficient mixing of the atmosphere to make any data extrapolation to the radon emission from the heap leach pile unreliable to reference. Often upwind radon measurements exceeded downwind radon measurements.

Additionally, there were several low-grade ore piles that were established within the perimeter of mill tailings impoundments. These low grade ore piles were leached by various solutions. However, no radon emission data specific to these operations were collected. Rather perimeter radon monitoring as well as beach monitoring data were collected. Again attempting to apply any of these radon measurements to the presence of the heap leaching area would be scientifically invalid.

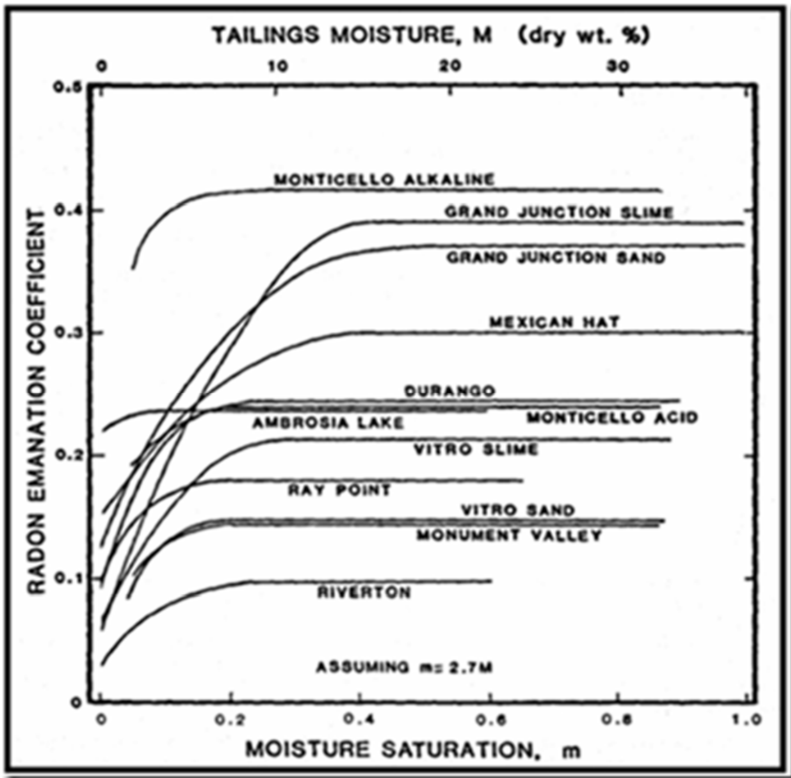
In the absence of operational data, it is difficult to establish a performance standard for radon emissions for heap leach sites. This apparent data void, resulted in the performance standard of a 30% moisture requirement. This moisture requirement has been determined to appropriately reduce radon emissions (see Figure 16, on Page 72).

We recommend that "actual" data ought to be collected from an operational site to determine the effect of the 30% moisture requirement.. An operational license condition may need to be included in the licensing package to monitor the moisture content and the radon emission. Comparison of these data with background conditions will allow a scientific determination of radon emission and risk to be evaluated.

- **COMMENT:** EPA should provide its estimate of the reduction factor for radon emissions that would be obtained by the 30 percent moisture content requirement. We observe that such an estimate was provided for the requirement for 1 meter of water covering nonconventional impoundments.

EPA Response: The reduction factor associated for radon emissions from water covered impoundments can be calculated by the well known radon attenuation equation, shown as Equation 6-1. The water radon attenuation factor is independent of the site's location and all other site specific characteristics, and depends only on the depth of the water cover.

Contrary to this, the radon reduction factor resulting from the application to the 30% moisture content GACT is heavily dependent on each site's characteristics. As the figure below shows, at 8% moisture content the radon flux is a maximum of about 2.3 times the dry ore flux. At 30% moisture content the radon flux has been reduced to below the dry ore flux. Therefore, this GACT results in a potential 2.3 reduction in the radon flux from the heap leach pile. Of course the exact reduction will depend upon the specific heap pile. For example, if a heap pile is operating at 20% moisture content without the GACT, then imposing the GACT would result in a radon flux reduction of about a factor of 1.6. Also, (see below), the response of the radon emanation coefficient to increasing moisture is very dependent on the material. This relationship between the emanation coefficient, moisture content, and material also influences the amount of reduction provided by the GACT.



As we cited earlier, the 30% moisture content effectiveness can be determined based on operational data, if and when heap leach sites are built and operated. An operational license condition may need to be included in the licensing package to monitor the moisture content and the radon emission.

- **COMMENT**: The moisture content within a heap pile is variable with time and heap leach piles are designed to drain, so it is not clear how the moisture content could be maintained above 30 percent once liquid application has stopped.

EPA Response: Of course, the moisture content of a heap leach pile is continuously changing, from saturation to some percentage of moisture. It is very likely (more probably assured), that in the western United States semiarid areas that the upper layer of the heap leach may reach air-dry moisture content which is much less than the 30% moisture content that has been established. The high evaporation rate, combined with brisk winds and almost constant sun will result in rapid drying of the surfaces of heap leach sites. This is particularity the case in the semiarid western United States, where there is the highest probability of a viable heap leach industry. To manage the drying that took place licensees were required, by license condition, to sprinkle beach areas, or otherwise maintain a water cover. This operation reduced radon exhalation and minimized the dispersal of wind-blown tailings. Operational inspections by regulatory individuals noted that this was a labor intensive and effective process, if the appropriate effort was devoted to the management practice.

To manage the 30% moisture requirement an operational license condition may need to be implemented. The actions associated with the license condition will need to be assessed during the active heap leaching cycle to determine what response is appropriate to reasonably maintain the 30% moisture requirement. Numerous environmental conditions are present in the semiarid high desert areas of the western United States. High summer temperatures are countered by below zero conditions in the winter. Additionally, near constant winds which are sometimes violent are not uncommon. Maintaining the moisture content at a predetermined value will be an operational challenge that will be unique to each heap leach site.

In order to maintain the 30% moisture content once liquid application has stopped (i.e., after active uranium leaching has ceased), it will be necessary for the licensee to continue to apply water to the pile. Because the purpose of the 30% moisture content requirement is to reduce radon emissions, and because radon emissions occur mainly from the top surface of the pile, it would not be necessary to maintain the entire pile at 30% moisture content, but only the upper portion of the pile. The exact depth to which the 30% moisture content requirement would apply would be determined on a site by site basis.

After active uranium leaching has ceased a final engineered cover would be constructed over the exhausted heap leach pile. Similar to the reclamation cover that was constructed over the Gas Hills heap leach piles, a final heap leach pile engineered cover would contain a radon barrier layer. Once the engineered cover has been constructed, than the 30% moisture content requirement would be withdrawn.

- **COMMENT:** Potential operators have described using multiple lifts within a heap leach pad; it is not clear how the 30 percent requirement would be applied in this situation.

<u>EPA Response</u>: Heap leach operations routinely utilize multiple lifts of ore. Commonly the ore is end dumped into the leaching area and then spread into a lift of varying thicknesses. This process does not lack science, in that ore simply needs to be placed into the leaching area. Each truck load of ore contains some degree of moisture; however, it is unlikely that incoming ore would have moisture content at or above the 30% level. To assure a 30% moisture content of the ore, an operational condition may need to be established during the licensing process and implemented at the site. Each lift will need to be monitored and have the moisture amended accordingly. In addition, it is important to manage the moisture content so as to minimize the compaction of the ore. The heap leach operator needs to avoid compacted areas of ore that could slow the movement of leaching solutions. Considering this situation and the 30% moisture requirement, the heap leach operator would add moisture as required.

Since the purpose of the 30% moisture content requirement is to control the radon emissions, it may not be critical to maintain the 30% moisture content in the lower lifts/levels of the pile. The reason for this is two-fold; first, radon generated in the lower lifts would have to travel further in the pile before it would escape to the atmosphere, thereby giving it more time to decay within the pile, and second, radon from the lower layers will be slowed due to the 30% moisture content in the upper lift layers.

Additionally, in some cases inter-lift liners are provided when the pile is composed of multiple lifts (Thiel and Smith 2004). If that is the case, the inter-lift liner would act as a barrier to the emission of radon from the lower lifts, and thus mitigate the need for those lower lifts to maintain the 30% moisture content.

Thiel, Richard, and Mark E. Smith, 2004, “State of the Practice Review of Heap Leach Pad Design Issues,” Geotextiles and Geomembranes, 22(5): 555-568.

- **COMMENT:** The 30 percent moisture content requirement appears to be based solely on radon emissions and does not appear to take into account the engineering properties of heap materials. This could result in slope stability or other operational issues within a heap.

EPA Response: It is agreed that the 30% moisture content requirement will impact the design of the heap leach pile. Principal concerns to be addressed during pile design are slope stability and the liquefaction potential. The impact that 30% moisture content will have on each of these parameters must be addressed during pile design. Nonetheless, it is believed that heap leach pile can be successfully designed, constructed, and operated with 30% moisture content mandate.

Regarding slope stability, many leach piles are provided with containment dikes which provide structural support to the pile. These dikes would not be affected by the 30% moisture content requirement, and thus would continue to provide support. Additionally, the pile design may be altered to increase its stability. For example, lower slopes, higher confinement dikes, the construction of stair-step pad grade, or the installation of textured (as opposed to smooth) geomembrane liner in critical areas would enhance pile stability.

The 30% moisture requirement will have little or no effect on the moisture requirements associated with the containment dikes. The containment dikes represent geotechnical structures that are constructed in compacted lifts to assure stability of the dikes

Regarding liquefaction potential, it has been estimated that liquefaction is unlikely if the degree of saturation in the pile is less than about 85% (Sassa 1985, as referred to in Smith 2002, Thiel and Smith 2004). Assuming a 2.7 ratio between moisture content and saturation (NRC 1984), the 30% moisture content require translates into 81% saturation, which is slightly below the level required for liquefaction. Needless to say, with the increase in the saturation that will result from the imposition of the 30% moisture content requirement, more attention will need to be paid to the pile design to minimize the liquefaction potential.

NRC (U.S. Nuclear Regulatory Commission) 1984. "Radon Attenuation Handbook for Uranium Mill Tailings Cover Design," V.C. Rogers, K.K. Nielson, Rogers and Associates Engineering Corporation, and D.R. Kalkwarf, Pacific Northwest Laboratory, NUREG/CR-3533, PNL-4878, RAE-18-5, April 1984.

Sassa, K. 1985. The mechanism of debris flows. Proc. of the 11th Intl. Conf. on Soil Mech. and Foundation Engineering, San Francisco, V. 3, pp. 1173-1176.

Smith, Mark E., 2002, "Liquefaction in Dump Leaching," Mining Magazine, July 2002.

Thiel, Richard, and Mark E. Smith, 2004, "State of the Practice Review of Heap Leach Pad Design Issues," Geotextiles and Geomembranes, 22(5): 555-568.

- **COMMENT:** We attempted to verify the make-up water application rate calculation on pages 89 and 90. It appears that the makeup water rate is close to the evaporation rate. If that is correct, the makeup water would be sufficient to make up for that water lost to evaporation. However, that does not mean that the water flow rate through the heap leach pile is sufficient to keep the pile at 30 percent moisture. The water flow rate required to keep moisture content at 30 percent would be based on how fast the water percolates through the heap leach pile. It appears that EPA has not provided any basis for concluding that a flow rate of 0.005 gpm/ft^2 is sufficient to maintain 30 percent moisture.

EPA Response: We are proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. We have defined this moisture content as sufficient in earlier rulemakings, and it is defined in the current Subpart W rule. However, we are requesting further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We are also requesting comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered and when the ability for radon to be emitted is the greatest Again, though, we are asking for comment on these processes and procedures in order to make an informed decision for the final rule.

6. **Prescriptive nature of requirement to maintain 1 meter of water within impoundments.** We note that the requirement to maintain 1 meter of water within an impoundment containing byproduct does not provide operators much flexibility. For example, a licensee may use an impoundment in conjunction with a land application system. The land application system may only be able to operate in warmer weather, and may need to have an impoundment nearly empty to provide sufficient disposal capacity for the time period during which the land application system is not capable of running. Additionally, if a liner is found to be leaking, the water level within the pond may need to be lowered to repair the liner system. As currently structured, this requirement does not give licensees any flexibility. We are also concerned that maintaining 1 meter of water over the liner may significantly increase the amount of liquids requiring disposal, especially at sites relying on some form of evaporation.

   EPA Response: While the one meter liquid requirement may be prescriptive, we have been in contact with uranium recovery operators who have been making the claim that because of the liquids in the impoundments, there are no radon emissions. Therefore, EPA decided to formalize in a regulation what owners and operators have been claiming for years. Also, it is important to note that this is a *proposed* rule, and the Agency has asked for comment on this approach.

7. **EPA inspection and oversight.** As currently structured, it appears that uranium recovery facilities with impoundments would be subject to EPA inspection and oversight. It is not clear to us if this is a regulatory burden that is calculated (in terms of the burden imposed on licensees).

   EPA Response: Under Subpart W, uranium recovery facilities with impoundments have always been subject to EPA inspection and oversight. This cost has been included in the ICR for this rulemaking, and are also included in Table 1 of the preamble, roughly page 66.

Specific Comments

1. Page 22, item A, describes the processes involved in a heap leach operation and identifies that potential liner systems could be constructed of plastic, clay, or asphalt. Based on discussions with potential heap leach licensees, we understand that modern geosynthetic liners will likely be used. **Corrected**.

2. Page 22, item B, describes liquid application practices that have previously been used at heap leach operations. Past practices likely did involve spraying acid on a heap leach pile, but potential operators have discussed using drip irrigation systems. For the rule language, it may be more accurate to say that acid would be applied by spraying, dripping, or flooding. **Corrected**

3. Page 22, items D and E, discusses using ion exchange as part of the uranium extraction process. It is our understanding that either ion exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site. **Corrected**

4. Titan Uranium has been acquired by Energy Fuels; however, several sections of the proposed rule refer to potential future actions proposed by Titan Uranium. We recommend updating sections of the text to reflect that future actions for the Sheep Mountain site will be led by Energy Fuels. Examples of this issue that should be addressed can be found on pages 37 and 119. **Corrected**

5. Several dates or anticipated milestones have already passed. We recommend updating text to reflect current timelines or that anticipated activities have (or have not) occurred. Examples of this that should be addressed can be found on pages 37 and 41. Note that the anticipated applications table can be found at this location: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf. **Corrected**

6. Page 90 has an incorrect Table reference. The text in the make-up water discussion should refer to Table 3, not Table 1. **Corrected.**

EPA-3001

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW RIN 2060-AP26.msg

- FW RIN 2060-AP26.msg

From: Rosnick, Reid
Sent: Monday, January 13, 2014 11:38 AM
To: Lee, Raymond
Cc: Peake, Tom; Nesky, Anthony; Herrenbruck, Glenna
Subject: FW: RIN 2060-AP26
Importance: High

Hi Ray,

It looks like we've cleared OMB! I have a draft of the action memo with Tom, I believe Tony has the communications stuff going, so just let me know how you want to proceed to get the package on the way! Thanks

Reid

From: Higgins, Cortney [mailto:Cortney_Higgins@omb.eop.gov]
Sent: Monday, January 13, 2014 11:09 AM
To: Rosnick, Reid
Cc: Schultheisz, Daniel; Stahle, Susan; Peake, Tom; Elman, Barry; Owens, Nicole; Muellerleile, Caryn
Subject: RIN 2060-AP26

Hi Reid,
We have concluded review of RIN 2060-AP26, "National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review." Please let me know if you have any questions.

Regards,
Cortney

EPA-3172

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE RIN 2060-AP26 (2).msg

- RE RIN 2060-AP26 (2).msg

From: Rosnick, Reid
Sent: Monday, January 13, 2014 11:22 AM
To: Higgins, Cortney
Subject: RE: RIN 2060-AP26

Thanks, Cortney.

And thanks for all your help in the review.

Best,
Reid

From: Higgins, Cortney [mailto:Cortney_Higgins@omb.eop.gov]
Sent: Monday, January 13, 2014 11:09 AM
To: Rosnick, Reid
Cc: Schultheisz, Daniel; Stahle, Susan; Peake, Tom; Elman, Barry; Owens, Nicole; Muellerleile, Caryn
Subject: RIN 2060-AP26

Hi Reid,
We have concluded review of RIN 2060-AP26, "National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review."
Please let me know if you have any questions.

Regards,
Cortney

EPA-3091

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE follow-up to voice mail on Subpart W .msg

- RE follow-up to voice mail on Subpart W .msg

From: Knapp, Kristien
Sent: Thursday, January 09, 2014 5:27 PM
To: Edwards, Jonathan
Cc: Flynn, Mike; McMichael, Nate; Rosnick, Reid; Stewart, Lori
Subject: RE: follow-up to voice mail on Subpart W

Very helpful – thank you!

From: Edwards, Jonathan
Sent: Thursday, January 09, 2014 5:25 PM
To: Knapp, Kristien; Stewart, Lori
Cc: Flynn, Mike; McMichael, Nate; Rosnick, Reid
Subject: RE: follow-up to voice mail on Subpart W

We know that OMB desk officer is happy with document and it's now in ROCIS for final OMB management clearance. We haven't received word that OMB management has cleared it yet but we do anticipate that that should occur reasonably soon and we don't expect any hitches. Then we will have to route the signature package up the chain here for final signature and FR publication, so it's seems reasonable that the 3rd floor should see it in a couple of weeks or so. We will let you know just as soon as we hear from OMB on clearance. Hope this helps… Jon

From: Knapp, Kristien
Sent: Thursday, January 09, 2014 5:07 PM
To: Edwards, Jonathan; Stewart, Lori
Cc: Flynn, Mike; McMichael, Nate
Subject: RE: follow-up to voice mail on Subpart W

Jon – I just left you a voicemail. Nate's getting questions from folks on the third floor who are expecting signature relatively soon, i.e., in the next couple weeks. Have you heard anything to indicate that OMB review is almost complete?

From: Edwards, Jonathan
Sent: Wednesday, January 08, 2014 9:52 AM
To: Stewart, Lori
Cc: Knapp, Kristien; Flynn, Mike
Subject: FW: follow-up to voice mail on Subpart W

Lori and Kristien-- Just a brief note to let you know that I was able to take care of the review I needed to do and clarify a few things with our lead rulewriter and get the OK from Mike yesterday to upload our **NESHAPS Subpart W proposal** (Radon emissions from operating uranium milling facilities) in ROCIS. Our rulewriter has contacted OP to start making that happen. Any questions, just call. Thanks, Jon
202.343.9437

From: Edwards, Jonathan
Sent: Monday, January 06, 2014 2:30 PM
To: Stewart, Lori
Cc: Lee, Raymond; Knapp, Kristien; McMichael, Nate; Nesky, Anthony; White, Rick; Rosnick, Reid
Subject: FW: follow-up to voice mail on Subpart W

Lori--- Here is the latest info on status of rad NESHAPS Subpart W proposal. I need to check a few things in the text of the draft rule this afternoon and have a quick check-in with my lead rule developer on this tomorrow (he's out of the office today) --- but should be able to give OP the thumbs up by tomorrow. Thanks, Jon

From: Peake, Tom
Sent: Monday, January 06, 2014 12:43 PM
To: Knapp, Kristien
Cc: White, Rick; Rosnick, Reid; Nesky, Anthony; Lee, Raymond; Edwards, Jonathan; Ferguson, Rafaela
Subject: follow-up to voice mail on Subpart W

Hello,
As of 12/20 we had been cleared by OMB staff (Courtney Higgins) to upload Subpart W into ROCIS. But we also got an email on 12/20 from OP (Caryn Muellerleile) that there needed to be some check with "management". With the holidays there was no movement on Subpart W until last week. I talked with Caryn today and its my understanding that OP had had a communication concern; since the action becomes public once it is in ROCIS OP wanted to make sure communications were ready once it hits ROCIS. We are ready here. I talked last week with our communications person here (Tony Nesky) about questions from the OAR press office and that is where I assume you got the estimated time frame.

To clarify, Subpart W will be ready for ROCIS this week (we are verifying that formatting changes like underlining, indentions, paragraph spacing, etc have been incorporated and we expect to send it to OP in a couple of days), then it will take time for the full package (action memo, etc) to go up the chain, so realistically we expect signature in a few weeks (end of January?) with publication in the Federal Register in February.

I hope this addresses your questions. Reid Rosnick (343-9563) is the rule manager and will be back in the office on Tuesday. Ray Lee is our regulatory liaison (343-9463).

Thank you.

Tom Peake
US EPA Radiation Protection Division
Director, Center for Waste Management and Regulations
phone: 202-343-9765

Original email from you last week:
We've gotten some conflicting, confusing messages re the Subpart W uranium mill tailings rule. Prior to the holiday we heard that OMB was prepared to clear it; last week we heard that OP was ready to upload it; also last week I heard from ORIA staff that it hadn't been approved through OMB management and wouldn't be ready for signature until February. Does anyone know where we are with this rule? Is it likely to clear OMB shortly and be ready for signature in the next week or so; or is it still in OMB review and more likely late February or even later?

Thanks,
Kristien

EPA-3090

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE follow-up to voice mail on Subpart W (4).msg

- RE follow-up to voice mail on Subpart W (4).msg

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Thanks,
Kristien

EPA-3135

Reid Rosnick

To	
cc	
bcc	
Subject	UPLOAD C:\Users\rrosnick\Desktop\TravisB\RE OMB Presentation.msg

- RE OMB Presentation.msg

From: Miller, Beth
Sent: Thursday, January 09, 2014 10:16 AM
To: Rosnick, Reid
Subject: RE: OMB Presentation

Done! Attached is the Docket content report.

From: Rosnick, Reid
Sent: Thursday, January 09, 2014 10:03 AM
To: Miller, Beth
Subject: RE: OMB Presentation

Please call it Meeting presentation to Office of Management and Budget by members of the National Mining Association. Thanks!

From: Miller, Beth
Sent: Thursday, January 09, 2014 10:02 AM
To: Rosnick, Reid
Subject: RE: OMB Presentation

No we never put this in the docket, I will add it now.

From: Rosnick, Reid
Sent: Thursday, January 09, 2014 8:06 AM
To: Miller, Beth
Subject: FW: OMB Presentation

Beth,

Did we ever put this in the Subpart W docket?

From: Sweeney, Katie [mailto:KSweeney@nma.org]
Sent: Friday, November 22, 2013 8:41 AM
To: Rosnick, Reid
Subject: RE: OMB Presentation

Sorry Reid – meant to forward this earlier, Here you go. Happy Thanksgiving.

Katie

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, November 22, 2013 8:40 AM
To: Sweeney, Katie
Subject: OMB Presentation

Hi Katie,

I was hoping to put your presentation to OMB on the Subpart W website sometime in the next week. I want to make sure that anyone else considering a meeting with OMB will get the chance to do so before the review period ends. If you would, at your convenience send me a copy of the briefing I'd appreciate it. Thanks, and have a happy Thanksgiving.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Document Search Results

Docket Id	Document Id
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-DRAFT-0001
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-DRAFT-0002
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-DRAFT-0003
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EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-DRAFT-0092

Title	Date Received	Phase
Surface Water Hydrology Considerations in predicting radon releases from water-covered areas of uranium tailings ponds	11/17/2009	Pending_Post
Radon releases from Austrailian uranium mining and millng projects: assessing the UNSCEAR approach	11/17/2009	Pending_Post
Minutes from December 3, 2009 stake holder conference call	1/4/2012	Pending_Post
Minutes from January 5, 2010 conference call	1/4/2012	Pending_Post
Minutes from April 6, 2010 stakeholders conference call	1/4/2012	Pending_Post
Minutes from July 6, 2010 stakeholders conference call	1/4/2012	Pending_Post
Minutes from October 5, 2010 stakeholders conference call	1/4/2012	Pending_Post
Minutes from January 5, 2011 stakeholders conference call	1/4/2012	Pending_Post
Minutes from April 7, 2011 stakeholders conference call	1/4/2012	Pending_Post
Minutes from July 7, 2011 stakeholders conference call	1/4/2012	Pending_Post
Minutes from October 6, 2011 stakeholders conference call	1/4/2012	Pending_Post
April 26, 2007 Notice of Intent to sue	1/4/2012	Pending_Post
Civil Suit filed against USEPA for failure to review/revise Subpart W in a timely fashion	1/4/2012	Pending_Post
History of NESHAPS and Subpart W Report 9/25/2008	1/4/2012	Pending_Post
Tailings Impoundment Technologies Report 9/25/2008	1/4/2012	Pending_Post
Review of Method 115 Report 9/25/2008	1/4/2012	Pending_Post
Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida [EPA-520/5-85-029] January 1986	1/4/2012	Pending_Post
Quality Assurance Project Plan (QAPP)	1/4/2012	Pending_Post
2009 Settlement Agreement between EPA and Plaintiffs	1/4/2012	Pending_Post
Letter to plaintiffs regarding settlement agreement on November 3, 2009	1/4/2012	Pending_Post
Work Plan for Risk Assessments	1/5/2012	Pending_Post
Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment for Lincoln Park/Cotter Uranium Mill	1/5/2012	Pending_Post

Comments by Steven H. Brown, CHP, SENES Consultants Limited 11/7/2010	1/5/2012	Pending_Post
NRC/NMA Uranium Recovery Workshop	1/5/2012	Pending_Post
National Mining Association 2008	1/5/2012	Pending_Post
Meeting material from presentation in Canon City, Colorado - June 30, 2009	1/5/2012	Pending_Post
National Mining Association 2009	1/5/2012	Pending_Post
Meeting material from presentation in Rapid City, South Dakota - October 1, 2009	1/5/2012	Pending_Post
Notes from meeting with National Mining Association	1/5/2012	Pending_Post
National Mining Association 2010	1/5/2012	Pending_Post
NESHAP Subpart W Activities An Internet Webinar - National Webinar	1/5/2012	Pending_Post
Tuba City Arizona Uranium Stakeholders	1/5/2012	Pending_Post
Uranium Recovery Workshop April 29 - 30, 2008	1/5/2012	Pending_Post
Uranium Recovery Workshop April 29 - 30, 2008	1/5/2012	Pending_Post
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012	Pending_Post
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012	Pending_Post
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012	Pending_Post
Uranium Recovery Workshop July 1- 2, 2009	1/5/2012	Pending_Post
National Emission Standards for Hazardous Air Pollutants; Standards for Radionuclides April 6 1983 Proposed Rule	1/6/2012	Pending_Post
Federal Register 40 CFR Part 61 192.32 a	1/6/2012	Pending_Post
October 31, 1984 ANPR Radionuclides	1/9/2012	Pending_Post
40 CFR Part 61 General Requirements	1/9/2012	Pending_Post
Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings [EPA 520/1-86-009]	1/9/2012	Pending_Post
National Emission Standards for Hazardous Air Pollutants (NESHAPs), Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings. September 24, 1986 Final Rule	1/9/2012	Pending_Post
Draft Environmental Impact Statement (EIS) for Proposed NESHAPS for Radionuclides	1/9/2012	Pending_Post

March 7, 1989 Proposed Rule, National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides	1/9/2012	Pending_Post
Risk Assessment Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (1)	1/9/2012	Pending_Post
Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (2)	1/9/2012	Pending_Post
Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (3)	1/9/2012	Pending_Post
December 15, 1989 Final Rule, National Emission Standards for Hazardous Air Pollutants; Radionuclides	1/9/2012	Pending_Post
Method 115- Monitoring for Radon-222 Emissions	1/9/2012	Pending_Post
Subpart T Rescission	1/9/2012	Pending_Post
40 CFR Part 61 192.32 a Errata	1/9/2012	Pending_Post
40 CFR Part 61 General Requirements Errata	1/9/2012	Pending_Post
EPA Procedures for Determining Confidential Business Information	1/9/2012	Pending_Post
October 17 2000 Errata	1/9/2012	Pending_Post
NRC's In-Situ Leach Facility Standard Review Plan	1/9/2012	Pending_Post
IAEA Uranium Mill Tailings Report	1/9/2012	Pending_Post
USEPA Contract Number EP-D-05-002	1/9/2012	Pending_Post
Letter to Angelique Diaz, USEPA from Frank Filas, Environmental Manager, Energy Fuels Resources Corporation on August 31, 2010	1/10/2012	Pending_Post
Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility	1/10/2012	Pending_Post
Evaporation Pond Design Report Pinon Ridge Project Montrose County, Colorado	1/10/2012	Pending_Post
Letter to Energy Fuels Resources Corporation from Steven H. Brown, SENES Consultants Limited on August 30, 2010	1/10/2012	Pending_Post
Raffinate Characterization Pinon Ridge Mill Montrose County, Colorado	1/10/2012	Pending_Post
Section 114 Letters/Responses	1/13/2012	Pending_Post
Comparison of CAP88 calculations from SC&A and the EPA web version of CAP88	1/26/2012	Pending_Post
Sheep Mountain Uranium Project	2/7/2012	Pending_Post

Status of Cell 3 at the White Mesa mill	2/7/2012	Pending_Post
Construction of An Environmental Radon Monitoring System Using CR-39 Nuclear Track Detectors	4/18/2012	Pending_Post
Letter from Kennecott Uranium Company to Mr. Reid Rosnick	5/2/2012	Pending_Post
Surface Water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds	5/31/2012	Pending_Post
Uranium Mill Tailings Radon Flux Calculations	5/31/2012	Pending_Post
Radon Emissions from Tailings and Evaporation Ponds	5/31/2012	Pending_Post
Minutes from January 5, 2012 Conference Call	5/31/2012	Pending_Post
Minutes from April 5, 2012 Conference Call	5/31/2012	Pending_Post
Colorado Citizens Against Toxic Waste (CCAT) Concerns about Cotter Uranium Mill	5/31/2012	Pending_Post
November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings	5/31/2012	Pending_Post
Risk Assessment Model Selection Methodology	5/31/2012	Pending_Post
Minutes from July 5, 2012	7/29/2013	Pending_Post
Minutes from October 4, 2012	7/29/2013	Pending_Post
Minutes from January 3, 2013 conference call	7/29/2013	Pending_Post
Minutes from April 3, 2013	7/29/2013	Pending_Post
Minutes from July 11, 2013	7/29/2013	Pending_Post
Experimental Determination of Radon Fluxes over Water	7/29/2013	Pending_Post
Subpart W-EIA-BID	7/30/2013	Pending_Post
Risk Assessment Revision for 40 CFR Part 61 Subpart W â€“	9/12/2013	Pending_Post
Record of Communication, May 16, 2013	9/17/2013	Pending_Post
Subpart W Stakeholders Conference Call of October 17, 2013	10/24/2013	Pending_Post
Subpart W Stakeholders Conference Call of January 2, 2014	1/7/2014	Pending_Post
Meeting presentation to Office of Management and Budget by members of the National Mining Association	1/9/2014	Metadata_Ready

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EPA-2989

Reid Rosnick

To

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Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW OMB Presentation.msg

- FW OMB Presentation.msg

From: Rosnick, Reid
Sent: Thursday, January 09, 2014 8:06 AM
To: Miller, Beth
Subject: FW: OMB Presentation

Beth,

Did we ever put this in the Subpart W docket?

From: Sweeney, Katie [mailto:KSweeney@nma.org]
Sent: Friday, November 22, 2013 8:41 AM
To: Rosnick, Reid
Subject: RE: OMB Presentation

Sorry Reid – meant to forward this earlier, Here you go. Happy Thanksgiving.

Katie

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, November 22, 2013 8:40 AM
To: Sweeney, Katie
Subject: OMB Presentation

Hi Katie,

I was hoping to put your presentation to OMB on the Subpart W website sometime in the next week. I want to make sure that anyone else considering a meeting with OMB will get the chance to do so before the review period ends. If you would, at your convenience send me a copy of the briefing I'd appreciate it. Thanks, and have a happy Thanksgiving.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Revision of 40 CFR Part 61 Subpart W

EPA Subpart W Rulemaking

- Legal Considerations
- Scientific/Technical Considerations
- Real World Implications

Revision of 40 CFR Part 61 Subpart W

Legal Considerations

Legal Issues

- EPA has no legal or regulatory bases to apply 40 CFR Part 61, Subpart W to evaporation ponds at uranium recovery facilities.
- After 20 years of consistent interpretation that Subpart W is only applicable to uranium mill tailings impoundments, EPA is inexplicably asserting that Subpart W applies to evaporation ponds at *in-situ* recovery and conventional mill tailings facilities.
- EPA's position is inconsistent with the language and the rulemaking history associated with Subpart W.
- By its very language, Subpart W only applies to active uranium mill tailings impoundments and makes no mention of evaporation ponds
- Specific language in Subpart W references uranium mills and their associated tailings
  - EPA regulations discuss mill tailings "piles"
- Specific examples provided in regulations to which Subpart W applies do not include evaporation ponds.
- Rule specifically discusses the presence of water (i.e., such as in evaporation ponds) as a reason not to be concerned about radon emissions since the water minimizes or eliminates emissions
  - In Subpart W rule, EPA notes that it does not intend to apply the expeditious radon cover requirement that derived from Subpart T's rescission to apply to evaporation ponds located on top of tailings piles/impoundments

Revision of 40 CFR Part 61 Subpart W

Technical Considerations

Potential Revisions
Inclusion of Waste Fluid Retention Impoundments

- One potential revision is the inclusion of waste fluid retention impoundments (evaporation ponds, holding ponds and other lined waste impoundments) not containing uranium mill tailings under 40 CFR Part 61 Subpart W
- This is not justified due to the insignificant emissions of radon from fluid retention impoundments as described in the slides that follow.

Radon Emissions from Tailings Ponds

Doug Chambers SENES Consultants Limited - 2009

- *Rn-222 gas exchange via diffusion from surface of small lake has been measured (Experimental lakes, Ontario).*
- *The data is shown below:*

Ra-226 (pCi/L)	Depth of Turbulent Mixing (cm)	Rn-222 ($pCi/m^2 \cdot s$)
10	10	0.002
	50	0.01
100	10	0.02
	50	0.1
1000	10	0.2
	50	1

- These fluxes are very low.
- Given the worst case regarding turbulent mixing (50 centimeters) with a Radium-226 activity of the water of 1000 pCi/L the flux is only 1 pCi/m2-sec.
- Fluid retention ponds do not present a substantial risk regarding of dose to a member of the general public from radon releases.
- Based on the above flux rates, any Radon-222 emanating from fluid retention ponds would be lost in the natural variability of background.

NMA

Radon Flux from Evaporation Ponds
Dr. Kenneth Baker – ERG - 2010

- The flux rates for water containing 165 pCi/L Radium-226 were very low as shown below:

Canister Number	Flux ($pCi\ m^{-2}s^{-1}$)	Flux Standard Deviation ($pCi\ m^{-2}s^{-1}$)	Percent Moisture Increase
43	1.77	0.06	11.06
12	1.12	0.05	10.57
82	.99	0.05	13.38
44	1.02	0.05	10.68
13	0.77	0.05	9.38
Mean	1.13		11.0

- These fluxes were measured by floating Large Area Activated Charcoal Canisters (LAACCs) on Radium-226 bearing water in a pond at Homestake's site North of Milan, New Mexico. A floating canister is shown below:

NMA

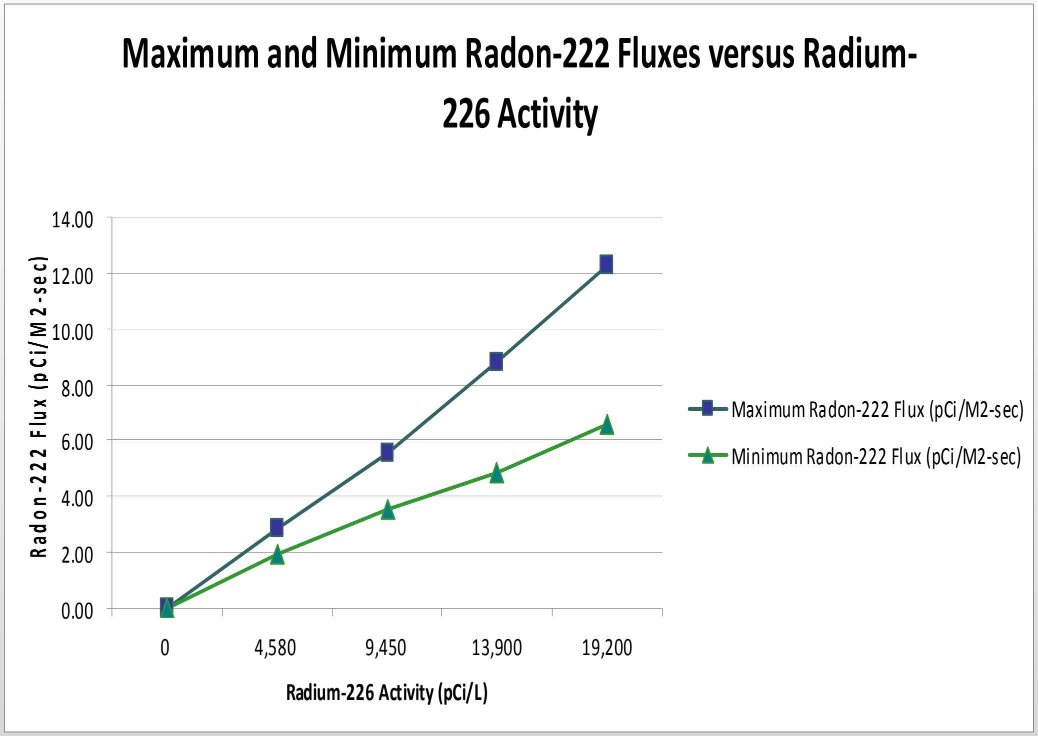
Experimental Determination of Radon Fluxes over Water
National Mining Association (NMA) 2012

- Experimental work funded by the National Mining Association (NMA) and conducted by Energy Laboratories, Inc. to determine radon fluxes over water in a laboratory setting was conducted.
- Large Area Activated Charcoal Canisters (LAACCs) were floated over water in barrels containing activities of Radium-226 and Radon-222 varying from 0 to 20,000 pCi/L in 5,000 pCi/L increments.
- A floating Large Area Activated Charcoal Canister (LAACC) as used in the experiment is shown below:

NMA

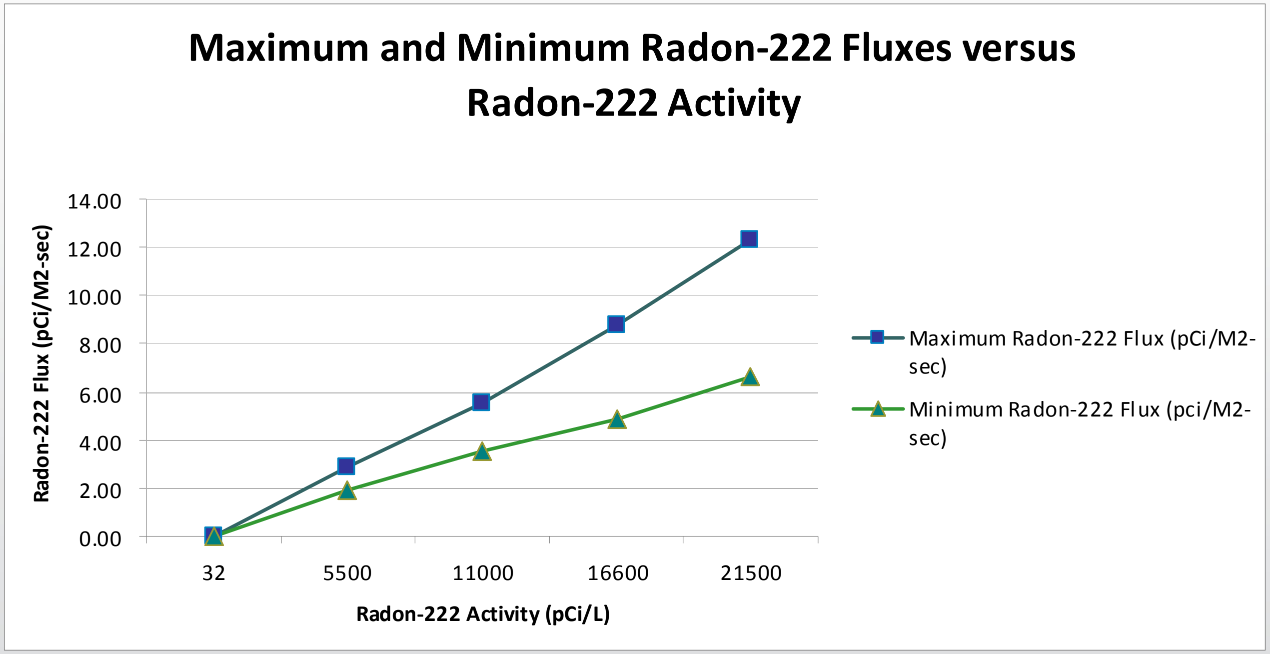
Experimental Determination of Radon Fluxes over Water National Mining Association (NMA) 2012 (con't)

- The results are shown below:



NMA

Experimental Determination of Radon Fluxes over Water National Mining Association (NMA) 2012 (con't)



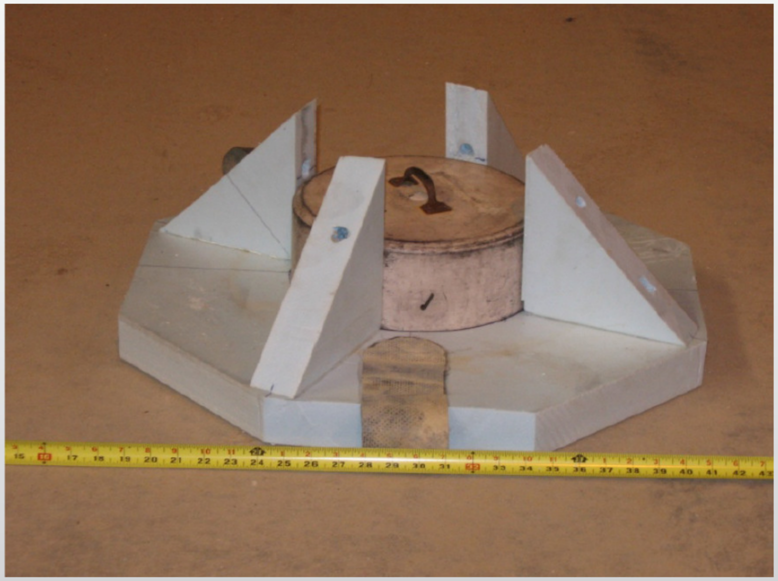
Experimental Determination of Radon Fluxes over Water National Mining Association (NMA) 2012 (con't)

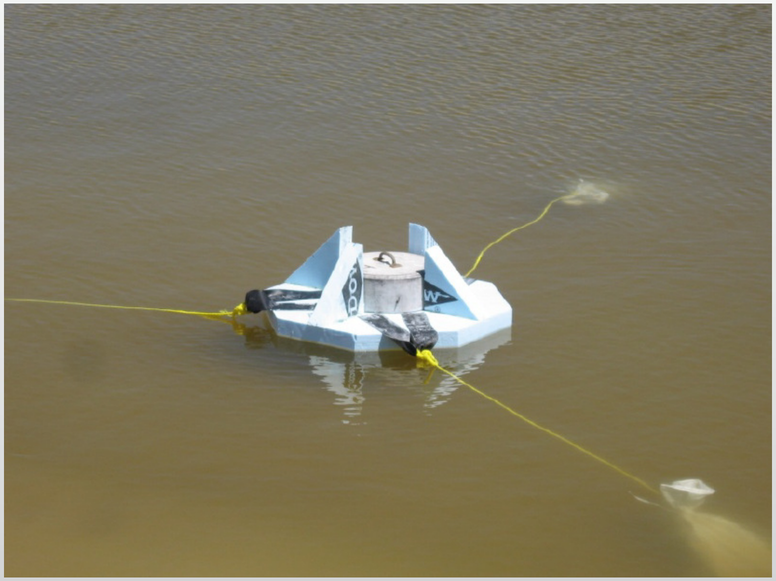
- Radon flux rates are low even at relatively high Radium-226 and Radon-222 activities for the water.
- Radon flux rates in pCi/m2-sec were approximately 0.0004 times the Radium-226 or Radon-222 activity of the water.
- At a Radium-226/Radon-222 activity of 5,000 pCi/L radon fluxes ranged from 1.9 to 2.8 pCi/m2-sec.
- According to *NUREG-1910 - Generic Environmental Impact Statement for In-Situ Leach Uranium Milling Facilities* – May -2009 over 96.9% of the liquid wastes at in-situ leach uranium recovery operations are restoration wastes with Radium-226 activities of 50 to 100 picoCuries per liter.
- This is vastly lower than 5,000 pCi/L and would yield proportionately lower fluxes that would for all intents and purposes be insignificant.

NMA

Determination of Radon-222 Fluxes from Fluid Filled Lagoons – Kennecott Uranium Company 2010

- Kennecott Uranium Company conducted experiments using floating Large Area Activated Charcoal Canister (LAACC) units to determine radon fluxes from the lagoons.
- Floating Large Area Activated Charcoal Canisters (LAACCs) are depicted below:





Determination of Radon-222 Fluxes from Fluid Filled Lagoons – Kennecott Uranium Company 2010

Pool	Radium-226 Activity	Radon-222 Activity in	LAAC Number	Placed		Retrieved		Charcoal	Measured Flux
Name	Fluid	Fluid		Date	Time	Date	Time	Moisture	
	(pCi/L)	(pCi/L)						(Percent)	(pCi/M2-sec)
1-E	26	570	116	8/10/2010	11:24	8/11/2010	12:53	3.1	0.83
1-E	26	570	117	8/10/2010	11:27	8/11/2010	12:54	2.0	0.82
1-E	26	570	1	8/11/2010	12:53	8/12/2010	13:18	3.1	<0.05
1-E	26	570	2	8/11/2010	12:54	8/12/2010	13:18	3.1	0.50
5-E	39	1750	118	8/10/2010	11:33	8/11/2010	12:57	2.9	0.78
5-E	39	1750	119	8/10/2010	11:37	8/11/2010	12:58	2.4	0.78
5-E	39	1750	3	8/11/2010	12:57	8/12/2010	13:20	3.0	<0.05
5-E	39	1750	4	8/11/2010	12:58	8/12/2010	13:22	2.9	0.57
9-W	22	772	120	8/10/2010	11:43	8/11/2010	13:01	2.8	0.76
9-W	22	772	121	8/10/2010	11:49	8/11/2010	13:03	2.6	0.67
9-W	22	772	122	8/10/2010	11:53	8/11/2010	13:04	1.7	0.63
9-W	22	772	5	8/11/2010	13:01	8/12/2010	13:25	3.5	0.51
9-W	22	772	6	8/11/2010	13:03	8/12/2010	13:27	3.5	0.51
9-W	22	772	7	8/11/2010	13:04	8/12/2010	13:27	2.5	0.56
SE Pool	15	446	123	8/10/2010	12:00	8/11/2010	13:09	3.6	0.64
SE Pool	15	446	124	8/10/2010	12:03	8/11/2010	13:11	2.5	0.61
SE Pool	15	446	125	8/10/2010	12:07	8/11/2010	13:12	2.0	0.64
SE Pool	15	446	8	8/11/2010	13:09	8/12/2010	13:32	3.3	<0.05
SE Pool	15	446	9	8/11/2010	13:11	8/12/2010	13:34	3.0	0.51
SE Pool	15	446	10	8/11/2010	13:12	8/12/2010	13:33	2.3	0.53

NMA

Determination of Radon-222 Fluxes from Fluid Filled Lagoons – Kennecott Uranium Company 2010 (con't)

- Radon fluxes from these ponds were very low.
- In no case did a radon flux measurement exceed 1.0 pCi/m2-sec.
- These fluxes do not exceed and are indistinguishable from natural background fluxes.

Risks Related to Radon from Uranium Recovery

- The following three (3) papers discuss epidemiology in three (3) uranium producing areas (Karnes County, Texas; Montrose County, Colorado and the Grants Area in New Mexico:
  - *Cancer Mortality in a Texas County with Prior Uranium Mining and Milling Activities 1950 to 2001* (Boice, J.D. Jr. et al September 8, 2003)
  - *Cancer and Noncancer Mortality in Persons Living near Uranium and Vanadium Mining and Milling Operations in Montrose County, Colorado 1950 – 2000* (Boice, J.D. Jr. et al 2007)
  - *A cohort study of uranium millers and miners of Grants, New Mexico, 1979–2005* dated August 28, 2008
- *Cancer Mortality in a Texas County with Prior Uranium Mining and Milling Activities 1950 to 2001* (Boice, J.D. Jr. et al September 8, 2003) concludes:
  - *Overall, 1223 cancer deaths occurred in the population residing in Karnes County from 1950 to 2001 compared with 1392 expected based on general population rates for the US. There were 3857 cancer deaths in the four control counties during the same 52 year period compared with4389 expected. There was no difference between the total cancer mortality rates in KarnesCounty and those in the control counties (RR = 1.0; 95% confidence interval 0.9–1.1). There were no significant increases in Karnes County for any cancer when comparisons were made with either the US population, the State of Texas or the control counties.*

NMA

Risks Related to Radon from Uranium Recovery (con't)

- *Cancer and Noncancer Mortality in Persons Living near Uranium and Vanadium Mining and Milling Operations in Montrose County, Colorado 1950 – 2000* (Boice, J.D. Jr. et al 2007) concludes:
  - *Between 1950 and 2000 a total of 1,877 cancer deaths occurred in the population residing in Montrose County, compared with 1,903 expected based on general population rates for Colorado (SMRCO 0.99). There were 11,837 cancer deaths in the five comparison counties during the same 51-year period compared with 12,135 expected (SMRCO 0.98). These was no difference between the total cancer mortality rates in Montrose county and those in the comparison counties (RR= 1.01; 95% CI 0.96-1.06).*
- *A cohort study of uranium millers and miners of Grants, New Mexico, 1979–2005* dated August 28, 2008 concludes:
  - *No statistically significant elevation in any cause of death was seen among the 904 non-miners employed at the Grants uranium mill. Among 718 mill workers with the greatest potential for exposure to uranium ore, no statistically significant increase in any cause of death of a priori interest was seen, i.e., cancers of the lung, kidney, liver, or bone, lymphoma, non-malignant respiratory disease, renal disease or liver disease. Although the population studied was relatively small, the follow-up was long (up to 50 yrs) and complete.*
- Three epidemiological studies show no risks to maximally exposed population groups specifically those living in areas hosting uranium processing.

NMA

Revision of 40 CFR Part 61 Subpart W

Real World Implications

Real World Implications

- Regulation of fluid retention impoundments under Subpart W will limit or halt uranium recovery operations
  - To operate, both conventional mills and in-situ recovery facilities can require large areas of evaporation ponds
  - Inclusion of evaporation ponds within existing area limitations would halt existing operations and prevent new ones from starting.
  - It would force current and future operators to consider alternate methods for handling fluids such as deep well injection which may not be approved halting current or planned operations. Even if approved, these alternate methods may be cost prohibitive.
  - Conflicts with existing approvals
    - Example: Kennecott Uranium has a license amendment in place allowing it to add a second (40 acre) tailings impoundment plus eight 10-acre evaporation ponds
      - Regulation of evaporation ponds under 40 CFR Part 61 Subpart W and inclusion of their area in the maximum allowable area would interfere with previously reviewed and approved plans. These approved plans have undergone NEPA review.

Real World Implications (con't)

- Alternatives to evaporation ponds may be in certain circumstances less desirable from an environmental perspective than evaporation ponds.
- Evaporation ponds are a proven, environmentally sound method for managing wastewater especially in the arid West where most uranium production occurs.
- Uranium recovery operations both conventional and in-situ, require an environmentally sound, proven and cost effective means to handle and store wastewater even where final disposition (deep disposal or irrigation) may be utilized. Evaporation ponds fill those requirements.
- Regulation of evaporation ponds and fluid retention impoundments under 40 CFR Part 61 Subpart W will severely constrain existing operations and proposed ones, in some cases halting them. This is poor policy in light of the very small risk and the need for domestically produced uranium to power this nation's reactors.

EPA-3202

Reid Rosnick

To

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- RE Sub-part W.msg

From: Rosnick, Reid
Sent: Wednesday, January 08, 2014 7:54 AM
To: Gary Smith
Subject: RE: Sub-part W

You're welcome. Ha!, I'm just an old guy who can't sleep, so I come to work ☺

From: Gary Smith [mailto:gary.smith@tceq.texas.gov]
Sent: Wednesday, January 08, 2014 7:52 AM
To: Rosnick, Reid
Subject: RE: Sub-part W

Reid,

Thanks for the update. You must be a real early-bird at your office!

Gary L. Smith, Ph.D.
Uranium Section
Radioactive Materials Division
Texas Commission on Environmental Quality
512-239-6460

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Wednesday, January 08, 2014 5:57 AM
To: Gary Smith
Subject: RE: Sub-part W

Hello Gary,

Happy New Year. We have actually made quite a bit of progress since we last spoke, but unfortunately, since the proposal has not been published I am limited to what I can say. The proposed rule went to OMB late last summer and is close to being cleared by them. After signature by the Administrator the proposed rule will be published in the Federal Register. We are hoping that will take place in early February. We anticipate a 90 day public comment period, and we expect to hold at least one public hearing. Stakeholders have requested Grand Junction CO as the venue, and we are looking into that.

I urge you to sign up at the Subpart W website (http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html)and sign up for the email alerts. I assume that once the rule is published it will also be posted on this website or at epa.gov/radiation. Hope this helps.

Reid

From: Gary Smith [mailto:gary.smith@tceq.texas.gov]
Sent: Tuesday, January 07, 2014 3:52 PM
To: Rosnick, Reid
Subject: Sub-part W

Reid,

I once again have the task of providing a Subpart W update at our annual Texas Commission on Environmental Quality - Trade Fair (May 2014). I gather from your Subpart W web site that the Subpart W package is still considered an internal and deliberative document? However, I still need to ask if there are any updates, previews, or news about the nature of the forthcoming revisions that you can share with me. If not, I'll dig around in your web site some more.

Thank you in advance for your assistance and good luck with completion of this huge task!

Gary L. Smith, Ph.D.
Uranium Section
Radioactive Materials Division
Texas Commission on Environmental Quality
512-239-6460

EPA-3180

Reid Rosnick

To

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- RE Sub-part W (5).msg

From: Rosnick, Reid
Sent: Wednesday, January 08, 2014 6:57 AM
To: Gary Smith
Subject: RE: Sub-part W

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Subject: Sub-part W

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Gary L. Smith, Ph.D.
Uranium Section
Radioactive Materials Division
Texas Commission on Environmental Quality
512-239-6460

EPA-3247

Reid Rosnick

To

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Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Sub-part W.msg

- Sub-part W.msg

From: Gary Smith [mailto:gary.smith@tceq.texas.gov]
Sent: Tuesday, January 07, 2014 3:52 PM
To: Rosnick, Reid
Subject: Sub-part W

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Thank you in advance for your assistance and good luck with completion of this huge task!
Gary L. Smith, Ph.D.
Uranium Section
Radioactive Materials Division
Texas Commission on Environmental Quality
512-239-6460

EPA-3236

Reid Rosnick

To

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Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W Minutes.msg

- Subpart W Minutes.msg

From: Rosnick, Reid
Sent: Tuesday, January 07, 2014 7:27 AM
To: Miller, Beth
Subject: Subpart W minutes

Hi Beth,

Can you please place these stakeholder conference call minutes in both the Subpart W website and the Subpart W docket? Thanks!

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Subpart W Stakeholders Conference Call
January 2, 2014

ATTENDEES

EPA: Reid Rosnick

Environmental Groups: Sharyn Cunningham, CCAT; Anita Minton, CCAT; Sarah Fields, Uranium Watch; Jennifer Thurston, INFORM

Uranium Industry/Other: Jim Cain, John Hamrick, Cotter; Travis Stills, Energy Minerals Law Center

UPDATE

Reid began the call with a welcome and by taking attendance. Reid had a couple of items to share. A link has been provided on the Subpart W website that links to the OMB webpage that documents a meeting between members of the National Mining Association and OMB, EPA, the Council on Environmental Quality and the Office of Science and Technology Policy. OMB explained at the outset that the meeting was for "listening purposes" only, meaning there was no discussion of issues related to Subpart W. A presentation (also on the OMB website) was given and the meeting was adjourned.

EPA has addressed the comments from OMB staff and other interagency comments successfully. OMB staff has cleared the draft rulemaking and it is now being reviewed by OMB management. After management approval the package will return to EPA, where several housekeeping items must be addressed before the package begins the trip to the Administrator's office for signature. After signature the proposed rule will be sent to the Office of the Federal Register for publication.

DISCUSSION

Jennifer Thurston: Encourage webinars and remote access for the public hearings. It will allow greater access for residents in uranium country. The OMB meeting tarnishes the sense of transparency, and does not help how the process is conducted. Wants to reiterate posting of OMB comments/responses on Subpart W website.
Sarah Fields: Also has a concern about the OMB meeting occurring concurrently with the rulemaking process. She believes the mining industry is very aggressive in this process. Suggested Grand Junction CO as a site for a public hearing since it is conveniently located from Denver and southern Utah.
Sharyn Cunningham: Agreed with the previous comments regarding the OMB meeting. Agreed that Grand Junction is a good location for a hearing.
Jennifer Thurston: Also agrees that Grand Junction is a good location, but argument can also be made for Gallup, NM, Cañon City, CO and White Mesa, UT.

Reid: We will look into the locations mentioned, and also the possibility of a webinar, although it might not be possible since an EPA hearing officer is required to be at all public hearings.
Travis Stills: Requests all information EPA shared with National Mining Association (NMA) be placed on EPA Subpart W website. Does not believe EPA is sharing all non-deliberative materials. Believes Reid and Ms Stahle are not trustworthy.
Reid: Explained that no information was shared with NMA during the meeting with OMB; perhaps Travis missed that discussion since he was late in joining the conference call. Being untrustworthy noted again.
Jennifer Thurston: Please discuss if you can any information contained in the proposed rule about regulating evaporation ponds.
Reid: Not at liberty to discuss language or policy in the proposed rule, but EPA stated at least 4 years ago that evaporation ponds are regulated under the current Subpart W rule.
Sarah Fields: Believes that too many impoundments and evaporation ponds are operating at the White Mesa mill. This has been occurring for many years and the State of Utah or EPA Region 8 has allowed it, stating that there is no public health issue. Also, what is the projected comment period for the proposed rule?
Reid: The information regarding status of evaporation ponds was a result of a discussion between Sarah and the State of Utah and EPA Region 8 Enforcement. Therefore I will not get into specifics regarding that discussion, but will note that EPA believes there is little to no radon flux in evaporation ponds that are covered with liquids. Regarding the time period for public comment, although generally EPA uses 60 days, we have taken the stakeholders advice and we are requesting a 90 day comment period.

Next call: Thursday, April 3, 2014 at 11 AM Eastern Time.

end

EPA-2965

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\FW follow-up to voice mail on Subpart W .msg

- FW follow-up to voice mail on Subpart W .msg

From: Edwards, Jonathan
Sent: Monday, January 06, 2014 2:40 PM
To: Stewart, Lori
Cc: Lee, Raymond; Knapp, Kristien; McMichael, Nate; Nesky, Anthony; White, Rick; Rosnick, Reid
Subject: FW: follow-up to voice mail on Subpart W

Lori--- Here is the latest info on status of rad NESHAPS Subpart W proposal. I need to check a few things in the text of the draft rule this afternoon and have a quick check-in with my lead rule developer on this tomorrow (he's out of the office today) --- but should be able to give OP the thumbs up by tomorrow. Thanks, Jon

From: Peake, Tom
Sent: Monday, January 06, 2014 12:43 PM
To: Knapp, Kristien
Cc: White, Rick; Rosnick, Reid; Nesky, Anthony; Lee, Raymond; Edwards, Jonathan; Ferguson, Rafaela
Subject: follow-up to voice mail on Subpart W

Hello,
As of 12/20 we had been cleared by OMB staff (Courtney Higgins) to upload Subpart W into ROCIS. But we also got an email on 12/20 from OP (Caryn Muellerleile) that there needed to be some check with "management". With the holidays there was no movement on Subpart W until last week. I talked with Caryn today and its my understanding that OP had had a communication concern; since the action becomes public once it is in ROCIS OP wanted to make sure communications were ready once it hits ROCIS. We are ready here. I talked last week with our communications person here (Tony Nesky) about questions from the OAR press office and that is where I assume you got the estimated time frame.

To clarify, Subpart W will be ready for ROCIS this week (we are verifying that formatting changes like underlining, indentions, paragraph spacing, etc have been incorporated and we expect to send it to OP in a couple of days), then it will take time for the full package (action memo, etc) to go up the chain, so realistically we expect signature in a few weeks (end of January?) with publication in the Federal Register in February.

I hope this addresses your questions. Reid Rosnick (343-9563) is the rule manager and will be back in the office on Tuesday. Ray Lee is our regulatory liaison (343-9463).

Thank you.

Tom Peake
US EPA Radiation Protection Division
Director, Center for Waste Management and Regulations
phone: 202-343-9765

Original email from you last week:
We've gotten some conflicting, confusing messages re the Subpart W uranium mill tailings rule. Prior to the holiday we heard that OMB was prepared to clear it; last week we heard that OP was ready to upload it; also last week I heard from ORIA staff that it hadn't been approved through OMB

management and wouldn’t be ready for signature until February. Does anyone know where we are with this rule? Is it likely to clear OMB shortly and be ready for signature in the next week or so; or is it still in OMB review and more likely late February or even later?

Thanks,
Kristien

EPA-2933

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\follow-up to voice mail on Subpart W .msg

- follow-up to voice mail on Subpart W .msg

From: Peake, Tom
Sent: Monday, January 06, 2014 12:43 PM
To: Knapp, Kristien
Cc: White, Rick; Rosnick, Reid; Nesky, Anthony; Lee, Raymond; Edwards, Jonathan; Ferguson, Rafaela
Subject: follow-up to voice mail on Subpart W

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Thanks,
Kristien

EPA-3243

Reid Rosnick

To

cc

bcc

Subject UPLOAD C:\Users\rrosnick\Desktop\TravisB\Subpart W Public Hearing Locations.msg

- Subpart W Public Hearing Locations.msg

From: Rosnick, Reid
Sent: Thursday, January 02, 2014 11:41 AM
To: Nesky, Anthony; Peake, Tom
Subject: Subpart W Public Hearing Locations

Tom/Tony,

I had a stakeholder conference call regarding Subpart W, and the general consensus was if we are limited to one meeting it should be in Grand Junction CO rather than Denver. Other candidates included Gallup, NM, Canon City, CO and White Mesa, UT. The consensus also included (if possible) a webinar so that more people in uranium country could be included.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3261

Tim Benner

To

cc

bcc

Subject UPLOAD C:\Users\tbenner\Documents\FOIA\5281\FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

- FW FR Dailies National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W Standards for Radon Emissions From Operating Uranium Mill Tailings Review is about to publish in the FR .msg

From: Rosnick, Reid
Sent: Wednesday, April 30, 2014 6:21 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis; Diaz, Angelique; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
Subject: FW: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

FYI,

A heads-up that the NESHAP Subpart W proposed rule will be published in the FR this Friday.

Reid

From: Stephanie Washington [mailto:Washington.Stephanie@epamail.epa.gov]
Sent: Tuesday, April 29, 2014 11:18 AM
To: Rosnick, Reid; Brooks, Patricia
Subject: FR Dailies: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review is about to publish in the FR.
Importance: High

Your document is about to publish in the Federal Register. This publication date has been confirmed with the Office of the Federal Register.
Title: National Emission Standards for Hazardous Air Pollutants (NESHAP) Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings: Review
FRL #: 9816-2
Docket #: EPA-HQ-OAR-2008-0218
Published Date: 05/02/2014

EPA-3262

Tim Benner

To

cc

bcc

Subject UPLOAD C:\Users\tbenner\Documents\FOIA\5281\Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule.msg

- Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule.msg

From: Rosnick, Reid
Sent: Thursday, April 17, 2014 9:49 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis; Diaz, Angelique; Aquino, Marcos; Button, Rich; Generette, Lloyd; Giardina, Paul; Honnellio, Anthony; Murphy, Michael; Povetko, Oleg; Rosenblum, Shelly
Subject: Heads-Up-Administrator's Signature on NESHAP Subpart W Proposed Rule

PER ADMINISTRATOR's REPORT---OAR will be releasing/signing a revision to propose Limiting Radon Emissions from Uranium Mill Tailings to an existing Hazardous Air Pollutants Rule soon. OAR anticipates industry to challenge the rule.

There are 12 existing facilities that are currently operating at a technology-based standard. Air program indicated states/tribes will generally be supportive (**YES**), industry opposed **(YES, may challenge the portions of the rule)**, environs in favor **(likely express frustration that the timeline the EPA used did not result in a new form of the standard and that the Agency is proposing a technology-based standard.)**

Where are the 12 facilities located (city, state)?
White Mesa Mill, Blanding, UT
Shootaring Canyon, Ticaboo, UT
Sweetwater Mill, Rawlins, WY
Alta Mesa, Brooks County TX
Crow Butte, Dawes County, NE
Hobson/La Palangana, South TX
Willow Creek, Christensen, WY
Smith Ranch, Converse County, WY
Uranium One, Luderman, WY
Lost Creek, Lost Creek, NE
Cameco, Marsland, NE
Powertech, Dewey Burdock, SD

As soon as the rule has been signed I will forward a copy.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3265

Tim Benner

To

cc

bcc

Subject UPLOAD C:\Users\tbenner\Documents\FOIA\5281\Subpart W NPRM.msg

- Subpart W NPRM.msg

From: Rosnick, Reid
Sent: Wednesday, January 22, 2014 9:30 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis
Subject: Subpart W NPRM

Hello All,

It has been a long time since my last status update. The reason for that is that nothing happened to Subpart W for quite some time. However, things are moving again and I have good news. The NRPM went through OMB relatively unscathed, with just some minor wordsmithing. I am now putting the package together for the Administrator's signature. We hope to have the rule in the FR in early February. I'll keep you posted.

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-3264

Tim Benner

To

cc

bcc

Subject UPLOAD C:\Users\tbenner\Documents\FOIA\5281\Status of the NPRM.msg

- Status of the NPRM.msg

From: Rosnick, Reid
Sent: Wednesday, June 05, 2013 8:21 AM
To: Benner, Tim; Brozowski, George; Carlson, Albion; Cherepy, Andrea; Diaz, Angelique; Dye, Robert; Elman, Barry; Garlow, Charlie; Ginsberg, Marilyn; Hoffman, Stephen; Hooper, Charles A.; Peake, Tom; Stahle, Susan; Anoma, Valentine; Walker, Stuart; Zhen, Davis
Subject: Status of the NPRM

Hello All,

Just a quick note to let you know that the Subpart W rulemaking package was uploaded by OMB last night. I'll keep you posed on our progress. Tanks.

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-4886

Susan Stahle

To

cc

bcc

Subject UPLOAD C:\Users\SSTAHLE\Documents\Outlook Collection\A copy of an official EPA record is attached (4).msg

- A copy of an official EPA record is attached (4).msg

-----Original Message-----
From: ecms@epa.gov [mailto:ecms@epa.gov]
Sent: Friday, June 06, 2014 10:14 AM
To: Stahle, Susan
Subject: A copy of an official EPA record is attached

This record was sent from the ECMS records repository on behalf of Susan Stahle
 - 783831:Uranium Watch Report: Subpart W Regulatory Confusion

EPA Official Record

Mail ID: 4F1D3605-A94D-41E5-BA8E-50A329B30CEE

From: sarah@uraniumwatch.org

To: Rosnick, Reid

Copy To: Stahle, Susan

Delivered Date: 08/08/2013 03:31 PM EDT

Subject: Uranium Watch Report: Subpart W Regulatory Confusion

Attachments: UW Report-Subpart W Regulatory Confusion.130720.pdf [129 KB]; ATT00001.txt [1 KB]

Dear Mr. Rosnick,

Attached please find a report regarding regulatory confusion
associated with the
EPA and State of Utah administration and enforcement of 40 CFR Part
61 Subpart W.

Please post this on the EPA Subpart W Review web page.

Sarah Fields
Director
Uranium Watch
PO Box 344
Moab, Utah 84532

Uranium Watch
Report

REGULATORY CONFUSION: FEDERAL AND STATE ENFORCEMENT OF 40 C.F.R. PART 61 SUBPART W

INTRODUCTION

1. This Uranium Watch Report, *Regulatory Confusion: Federal and State Enforcement of 40 C.F.R. Part 61 Subpart W*, documents and discusses Environmental Protection Agency (EPA) and Utah Division of Air Quality (DAQ) regulatory confusion and regulatory failures associated with the administration and enforcement of 40 C.F.R. Part 61 Subpart W, National Emission Standards for Radon Emissions From Operating Mill Tailings. The report examines how Subpart W has been, and is being, applied at the White Mesa Uranium Mill, San Juan County, Utah.

2. The DAQ, a Division of the Utah Department of Environmental Quality, administers and enforces Subpart W and other federal radioactive National Emission Standards for Hazardous Air Pollutants (NESHAPS) in the State of Utah. The DAQ also implements the general provisions of 40 C.F.R. Part 61 Subpart A, which includes provisions for applications and approvals of new uranium mills and new processing waste impoundments at existing facilities. Subpart W was promulgated by the EPA on December 15, 1989—over 23 years ago.[1] The State of Utah assumed authority for the radioactive NESHAPS from the EPA in 1995.[2]

APPLICABILITY OF SUBPART W

3. According to 40 C.F.R. § 61.250, the provisions of Subpart W "apply to owners or operators of facilities licensed to manage uranium byproduct materials during and following the processing of uranium ores, commonly referred to as uranium mills, and their associated tailings." Therefore, the White Mesa Uranium Mill is subject to the Subpart W requirements. Subpart W does not apply to the disposal of tailings; that is, after closure of a uranium mill or a tailings impoundment.

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[1] 54 Fed. Reg 51654, December 15, 1989

[2] 60 Fed. Reg. 13912, March 15, 1995

IMPLEMENTATION OF 40 C.F.R. SECTION 61.252(b)(1) — HOW MANY IMPOUNDMENTS ARE ALLOWED?

4. Regulation: Section 61.252(b)(1) — *The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time*.

5. White Mesa Mill Implementation: The White Mesa Mill currently has six (6) impoundments "in operation." This is a direct violation of the requirement for no more than two (2) impoundments in operation at any one time. Cells 3 and 4B receive solid tailings, and Cells 1 and 4B receive processing liquids. A fifth impoundment, Roberts Pond, also receives liquid wastes. The 6th tailings impoundment, Cell 2, also should be considered "in operation," according to the definition of "operation," in Section 61.251 (e). See discussion of Cell 2 starting at 16, below.

6. Ever since 1990, when Subpart W became effective, there have been three (3) or more impoundments in operation at the White Mesa Mill. Cell 2 was completed in May 1980, Cell 1 in June 1981, and Cell 3 in September 1982.[3] The EPA issued their approval of the construction of Cell 4A in March 1989, and the cell was constructed that year.[4] UW does not know when Roberts Pond was constructed, when it began receiving processing wastes, or if or when it was approved by the EPA or DAQ.

7. Currently, EPA Region 8 acknowledges that Mill is out of compliance with the limitation on the number of impoundments allowed by Subpart W. However, according to the EPA, since two of the impoundments are being used to hold liquids, the mass radon flux is calculated to be zero. Therefore, the EPA is not planning to pursue enforcement at this time, because they have determined that there are no calculated health impacts from the additional impoundments being used as holding ponds for liquids. The radon emissions from the ponds have not actually been measured.

8. Regulatory Confusion: It appears that for many years there has been regulatory confusion and regulatory indifference regarding whether impoundments that receive liquids count as tailings impoundments for the purposed of Subpart W compliance. According to Subpart W definitions, "operation" means that an impoundment is being used for the continued placement of new tailings.[5] The definition also states: "An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins." Subpart W defines tailings (or uranium byproduct material) as "the waste produced by the extraction or concentration of uranium from any ore

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[3] Denison Mines White Mesa Mill, Application for Approval of Modification of an Existing Source Under 40 CFR 61.07, State of Utah Division of Air Quality, Approval Order Number DAQE-AN0112050008-08, Denison Mines (USA) Corporation, April 13, 2010.

[4] http://www.uraniumwatch.org/whitemesamill/EFR-DAQ_SupartWAnnualRpt.130329.pdf

[5] 40 C.F.R. § 61.251(e).

processed primarily for its source material content."[6] Tailings fluids and processing liquids are included in the definition of 11.e.(2) byproduct material, or tailings. Therefore, an impoundment that receives liquids is also a tailings impoundment and should be counted when determining the number of impoundments "in operation." However, 23 years after Subpart W was promulgated, there is still confusion regarding the implement and enforcement of the limitation on the number of operational impoundments.

9. Only recently has the EPA given any indication that there might be a problem with the number of tailings impoundments at White Mesa. Only recently, did the EPA acknowledge that all impoundments that received 11e.(2) byproduct material, whether solids or liquids, counted when determining the number of operational impoundments.

10. As recently as April 13, 2010, the owner of the White Mesa Mill applied for approval of the construction of tailings cell 4B, pursuant to 40 C.F.R. § 61.07. In that application, Denison Mines assumed that only impoundments receiving solid tailings were considered "impoundments" for the purposes of Section 61.252(b)(1) compliance.

11. The DAQ approved the construction of cell 4B, even though the Cells 1, 3, 4A, and Roberts Pond were being used as impoundments for the placement of 11.e.(2) byproduct material. Clearly, the DAQ did not include the impoundments that were receiving liquid waste when determining the number of operating impoundments.

12. In March 29, 2013, Energy Fuels Resources (USA) Inc. (Energy Fuels), the new name of the owner of the White Mesa Mill, submitted the 2012 Annual Subpart W Compliance Report to the DAQ.[7] The DAQ completed a compliance review of the NESHAP Part 61 Subpart W Annual Report.[8] The April 17, 2013, DAQ compliance review addressed compliance with the Section 61.252 Standard for radon emissions for Cells 2 and 3 and the 61.254 Annual Reporting Requirements. However, the compliance review did not address compliance with the Section 61.252(b)(1) limitations on the number of operating impoundments. So, the DAQ conveniently omitted any mention of the Mill's compliance with this significant section of the Subpart W standard.

13. The DAQ made no determination regarding the Mill's compliance with Section 61.252(b)(1). Since the DAQ avoided any determination of Section 61.252(b)(1) compliance, there was no finding of non-compliance, and, thus, no need for Energy Fuels

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[6] 40 C.F.R. § 61.251(g).

[7] White Mesa Uranium Mill, National Emissions Standards for Radon Emission from Operating Mill Tailings Transmittal of 2012 Annual Radon Flux Monitoring Reports; Energy Fuels Resources (USA) Inc. to Bryce Bird, Director, Division of Air Quality; March 29, 2013.

[8] Memorandum, File - Denison Mines - White Mesa Mill; from Sarah Malluche, Environmental Scientist, through Jay Morris, Minor Source Compliance Section Manager; DAQ-213-004531; PCE, Minor, San Juan County, AIRS #037-00017; April 17, 2013.

to take any actions to bring the Mill into compliance. This was a clear abrogation of the DAQ's Subpart W administrative and enforcement responsibilities.

14. As discussed above, EPA Region 8 acknowledges that Mill is out of compliance with the limitation on the number of impoundments allowed by Subpart W. But, not to worry, such non-compliance is not important enough to trigger the issuance of a Notice of Violation (NOV). Again, there is evidence of regulatory confusion.

15. There is an EPA NESHAP standard, but non-compliance with the standard at the only operating conventional uranium mill in the US is perfectly all right—if the EPA determines that there is no health impact. There is no mention of such an exemption in Subpart W. Normally, when a licensee or permittee seeks an exemption from compliance with a regulatory requirement or standard, it must make a request for an exemption and justify the exemption. In this case, apparently, the EPA has taken the initiative to exempt the White Mesa Mill from the Subpart W standard that limits the number of operating impoundments at a uranium mill. This exemption occurs at the same time that the emissions from another impoundment, Cell 2, have been found to be greater than the Subpart W radon flux standard.

16. Clearly there has been regulatory confusion regarding compliance with the limitation of the number of impoundments. Clearly there has been a conscious effort on the part of the DAQ and EPA to circumvent enforcement of that standard at the White Mesa Mill.

IMPLEMENTATION OF 40 C.F.R. SECTION 61.252(b)(1) — WHEN IS AN IMPOUNDMENT OPERATIONAL?

17. Regulation: Section 61.252(b)(1) — *The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.*

Definition*:* Section 61.251(g) — *An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.*

18. White Mesa Mill Implementation: Cell 2 no longer receives tailings; however, it does not appear that "closure" has begun for Cell 2. Most of the information about Cell 2 does not support the conclusion that "closure" has begun for Cell 2. Most of the information about Cell 2 supports a finding that Cell 2 is still subject to the Subpart W standard as an operational impoundment. The following facts are relevant:

A. Energy Fuels has continued to monitor the radon flux for Cell 2 and submit the results to the DAQ on an annual basis. The 2012 Subpart W Compliance Report included data on the radon flux for Cell 2 and found that Cell 2 was not in compliance with the Subpart W radon flux standard. In response to that report, the DAQ confirmed that Cell 2 was not in compliance with the Subpart W radon flux standard. The April 17, 2013, DAQ compliance review states that "due to the exceedance from Cell #2, monthly reports are required to be submitted," and that "the first report will be submitted April 2013."[9]

B. Energy Fuels determined that the increase in the radon flux was the result of the dewatering of Cell 2. The Energy Fuels' Annual Compliance Report proposed mitigative measures to reduce the radon emissions from Cell 2 in order to bring it within the radon flux standard in Section 61.252(a). The 2012 Compliance Report reiterated the applicability of the Subpart W standard to Cell 2. If closure had begun for Cell 2, Subpart W would no longer apply to Cell 2, because the impoundment was no longer "in operation."

C. The 2012 Annual Compliance Report states: "At present, there are no Subpart T uranium mill tailings at this site."[10] Subpart T, in part, applies to "owners and operators of non-operational uranium mill tailings disposal sites that are licensed by the NRC or an affected Agreement State." The lack of any Subpart T mill tailings at the site means that there are no tailings disposal cells at the White Mesa Mill that are non-operational.

D. Neither Energy Fuels, nor the previous Mill owner, informed the Utah Division of Radiation Control (DRC) that Cell 2 is not operational and undergoing closure. There has been no license amendment that states that Cell 2 is undergoing closure.

E. The DRC's draft renewed source material license for the White Mesa Mill is for the operation of Tailings Cells 1, 2, 3, 4A, and 4B (License Condition 9.1).[11]

F. The Utah Division of Water Quality, Ground Water Discharge Permit (GWDP), Permit No. UGW370004, for the White Mesa Mill, dated August 30, 2012, states: "Existing Tailings Cell Construction Authorized - tailings disposal in existing Tailings Cells 1, 2, and 3 is authorized by this Permit as defined in Table 3 and Part I.D.1. above." The DRC administers and enforces the GWDP for the White Mesa Mill, on behalf of the Division of Water Quality.

G. EPA regulations at 40 C.F.R.Part 192 also apply to Cell 2. Section 192.32(a)(3)(i) states:

> (3)(i) Uranium mill tailings piles or impoundments that are nonoperational and subject to a license by the Nuclear Regulatory

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[9] http://www.uraniumwatch.org/whitemesamill/EFR-DAQ_SupartWAnnualRpt.130329.pdf

[10] National Pollution Standards for Hazardous Air Pollutants, 2012 Radon Flux Measurement Program, White Mesa Mill, June 2012 Sampling Results, Tellco Environmental, page 2, at 3.

[11] http://www.uraniumwatch.org/denisonmill.ut/drc_draft_whitemesa_LicenseRenewal_redline.111012.pdf

> Commission or an Agreement State shall limit releases of radon-222 by emplacing a permanent radon barrier. This permanent radon barrier shall be constructed as expeditiously as practicable considering technological feasibility (including factors beyond the control of the licensee) after the pile or impoundment ceases to be operational. **Such control shall be carried out in accordance with a written tailings closure plan (radon) to be incorporated** by the Nuclear Regulatory Commission or Agreement State **into individual site licenses.** [Emphasis added.]

EPA regulation at 40 C.F.R. Section 192.31(n) defines "Tailings Closure Plan":

> (n) Tailings Closure Plan (Radon) means the Nuclear Regulatory Commission or Agreement State approved plan detailing activities to accomplish timely emplacement of a permanent radon barrier. A tailings closure plan shall include a schedule for key radon closure milestone activities such as wind blown tailings retrieval and placement on the pile, interim stabilization (including dewatering or the removal of freestanding liquids and recontouring), and emplacement of a permanent radon barrier constructed to achieve compliance with the 20 pCi/m\2\-s flux standard as expeditiously as practicable considering technological feasibility (including factors beyond the control of the licensee).

The Part 192 regulations are also incorporated into Nuclear Regulatory Commission (NRC) regulations at 10 C.F.R. Part 40, Appendix A, Criterion 6A. Appendix A, Criterion 6A, applies to Utah, as an NRC Agreement State for 11e.(2) byproduct material.

H. The White Mesa Mill License[12] does not include an approved Closure Plan—or any Reclamation Plan. If, in fact, Cell 2 was undergoing closure and final closure had begun, the License would include Cell 2 reclamation milestones for the removal of free-standing liquids (dewatering), placement of the interim cover, and placement of the final radon barrier. However, no enforceable reclamation milestones for the closure and reclamation of Cell 2 have been incorporated into the License as license conditions.

I. The 2012 Annual Compliance Report submittal (page 1) states that the Cell 2 dewatering activities are mandated by the mill's State of Utah GWDP. There is no reference in the Energy Fuels' Report to dewatering activities mandated by the mill's closure plan or a reference to an enforceable reclamation milestone for the removal of free-standing liquids from Cell 2. The EPA rescinded 40 C.F.R. Part 61 Subpart T under the assumption that enforceable reclamation milestones would be incorporated into uranium mill licenses as part of the Closure Plan.[13]

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[12] http://www.uraniumwatch.org/denisonmill.ut/drc_draft_whitemesa_LicenseRenewal_redline.111012.pdf

[13] 59 FR 36302, July 15, 1994

19. In sum, there is nothing on the record for the White Mesa Mill that demonstrates the closure has begun for tailings impoundment Cell 2 or indicates the date that final closure began. Therefore, Cell 2 must be considered "operational" for the purposes of compliance with the Section 61.252(b)(1) requirement that the mill "owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time."

20. It is apparent that the Subpart W program neglects the interface with the regulatory program for uranium mills under the Atomic Energy Act, as administered and enforced by the NRC or an NRC Agreement State. In Utah there seems to be little if any communication between the DAQ and the DRC regarding the issue of when, exactly, is the day that final closure begins, or other aspects of the closure of a tailings impoundment.

21. Regulatory Confusion: The situation with the status of tailings Cell 2 at the White Mesa Mill reveals regulatory confusion and brings forth a number of questions. As outlined above, there is no information that supports the conclusion that "closure" has commenced for Cell 2. There is no information regarding the date that final closure began for Cell 2.

22. Neither the EPA nor the DAQ have addressed the issue of when closure begins for a uranium mill impoundment on a programmatic or site-specific basis. Important questions have not been answered, including:

- When, exactly, does "closure" begin?
- What action or event triggers the commencement of "closure"?
- Who or what defines the day that closure begins?

23. The regulatory agencies have failed to provide any information regarding the specific regulatory action that takes an impoundment out from under the Subpart W regulatory requirements, because closure has commenced and the impoundment is no longer operational?

OTHER ISSUES

24. The application to the DAQ for Cell 4B states that the surface area for Cell 4A is 44 acres, not 40 acres. Other information provided by Energy Fuels states that after the installation of Cell 4B, both cells are 41 acres. Therefore, these cells are larger than the 40-acre requirement in 40 C.F.R. 61.252(b). Subpart W does not provide guidance regarding the exceedance of the 40-acre construction standard.

25. Roberts Pond. According to the licensee, Roberts Pond also receives liquid wastes. Therefore, it is an impoundment. There is no evidence that the licensee requested approval of the operation of Roberts Pond, pursuant to 40 C.F.R. § 61.07; that it was

approved by the EPA or DAQ, pursuant to 40 C.F.R. § 61.08; or (if the pond was constructed prior to 1990), the licensee provided the EPA with information required for existing sources, pursuant to § 61.10. It is now known why Energy Fuels is being permitted to use Roberts Pond for 11e.(2) byproduct material.

CONCLUSION

- Since 1990, Subpart W has not been properly administered and enforced by either the EPA or DAQ. This failure to properly administer and enforce Subpart W continues to impact the only operating conventional uranium mill in the United States, the White Mesa Mill.

- There has been confusion about what, exactly, counts as a tailings impoundment when determining the number of operating impoundments.

- There is an ongoing failure to enforce the Subpart W standard for the number of operational impoundments. In other words, the law is not the law.

- There is confusion regarding when an exemption to the Subpart W standard is allowed and the process under which such a exemption can be obtained.

- There is confusion about when an impoundment is "operational," for purposes of Subpart W compliance, and when "final closure" actually begins.

Sarah Fields
Director
Uranium Watch
PO Box 344
Moab, Utah 84532
435-259-9450

EPA-4923

Susan Stahle

To

cc

bcc

Subject UPLOAD C:\Users\SSTAHLE\Documents\Outlook Collection\A copy of an official EPA record is attached (19).msg

- A copy of an official EPA record is attached (19).msg

-----Original Message-----
From: ecms@epa.gov [mailto:ecms@epa.gov]
Sent: Friday, June 06, 2014 10:36 AM
To: Stahle, Susan
Subject: A copy of an official EPA record is attached

This record was sent from the ECMS records repository on behalf of Susan Stahle
- 779274:Follow Up of Today's Subpart W Conference Call

EPA Official Record

Mail ID: 20131017123854.0b92880d8ceba4209686016b4a5c8f39.37f2d8dad3.wbe

From: sarah@uraniumwatch.org

To: Stahle, Susan

Copy To: Rosnick, Reid

Delivered Date: 10/17/2013 03:39 PM EDT

Subject: Follow Up of Today's Subpart W Conference Call

Dear Ms. Stahle,

As a follow up of this mornings Subpart W Review conference call, I would like some additional information.

In response to my question regarding the NEPA review for the proposed rule, you stated that the EPA Clean Air Act rulemakings are exempted from NEPA. citing Section 307. I looked at Section 307 of the Clean Air Act and could not find any indication of such an exemption.

However, Section 312, appears to require an analysis on the impacts to public health, economy, and the environment for a Subpart W rulemaking.

Considering the fact that the EPA produced an Environmental Impact Statement for the promulgation of the Radionuclide NESHAPS in 1989, I assumed that the EPA would supplement that EIS for this proposed amendment to Radionuclide NESHAPS regulations. I must have missed something.

Please point me to the exact section and subsection that exempts this Subpart W rulemaking from any NEPA analysis. Please explain why there was an EIS in 1989, but the EPA is not supplementing that EIS for this rulemaking.

I did see in Section 307 that the EPA is required to make the documents related to the OMB and inter-agency consultation available on the docket prior to the release of the Proposed Rule. Section 307(d)(4)(B)(ii). The availability of these documents was discussed in today's call.

Also, I see that the EPA "shall give interested persons an opportunity for the oral presentation of data, views, or arguments, in addition to an opportunity to make written submissions." Section 307(d)(5). That opportunity has not been mentioned in the conference calls. I would be helpful to know how the EPA will be providing opportunities for oral presentations in this Subpart W rulemaking.

Thank you,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84532
435-210-0166 (mobile)

EPA-4924

Susan Stahle

To

cc

bcc

Subject UPLOAD C:\Users\SSTAHLE\Documents\Outlook Collection\A copy of an official EPA record is attached (20).msg

- A copy of an official EPA record is attached (20).msg

-----Original Message-----
From: ecms@epa.gov [mailto:ecms@epa.gov]
Sent: Friday, June 06, 2014 10:36 AM
To: Stahle, Susan
Subject: A copy of an official EPA record is attached

This record was sent from the ECMS records repository on behalf of Susan Stahle
 - 779271:RE: Follow Up of Today's Subpart W Conference Call

-----Original Message-----
From: ecms@epa.gov [mailto:ecms@epa.gov]
Sent: Friday, June 06, 2014 10:27 AM
To: Stahle, Susan
Subject: A copy of an official EPA record is attached

This record was sent from the ECMS records repository on behalf of Susan Stahle
 - 1107473:Public Hearing Question

EPA-4940

Susan Stahle

To

cc

bcc

Subject UPLOAD C:\Users\SSTAHLE\Documents\Outlook Collection\A copy of an official EPA record is attached (36).msg

- A copy of an official EPA record is attached (36).msg

EPA Official Record

Mail ID: 86974650e41846c1bb2c3e8befe63a85

From: Rosnick, Reid

To: Stahle, Susan

Copy To: Nesky, Anthony

Delivered Date: 01/22/2014 12:47 PM EST

Subject: Public Hearing Question

Sue,

Tony and I have been discussing the Subpart W public hearing process. A question: We assume that the hearing has to run until everyone has spoken. If we have over 100 speakers, it could possibly stretch into another day. Have you had this kind of experience? Should we plan on two days (but only advertise one day) in the event of a large crowd? (Sorry, two questions)

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

EPA-5320

Paul Logan

To

cc

bcc

Subject UPLOAD C:\Users\plogan\Desktop\Sub W\3 21 14 Mtg with Ute Mtn Ute Chairman and Shaun Subpart W and CERCLA issues.msg

- 3 21 14 Mtg with Ute Mtn Ute Chairman and Shaun Subpart W and CERCLA issues.msg

From: Saldenha, Jasmine
Sent: Thursday, March 20, 2014 5:33 PM
To: Ward, W. Robert; Logan, Paul; Laumann, Sara
Subject: 3/21/14 Mtg with Ute Mtn Ute Chairman and Shaun: Subpart W and CERCLA issues

Hi Bob & Paul,

The meeting between Chairman Heart and Shaun will take place tomorrow at 9:30 in the RA's Conference Room. Janet McCabe from the HQ Air Program will be here for that meeting.

Alfreda doesn't think the Tribe's legal counsel will be there, but she has asked that someone from ORC be available at 9:30 in the RA's Conference Room and Shaun can dismiss them if he doesn't think their participation is necessary.

Here is a list of what the Tribe is seeking from EPA (and will, therefore, be discussed):

1. Removal of White Mesa from the list of facilities deemed "acceptable" to receive CERLA waste (alternative feed) until the three oldest cells are reclaimed and the environmental impacts are addressed;
2. A more robust decision-making process when the Region makes CERCLA Off-Site Rule determinations;
3. Immediate consultation with EPA (HQ) on the Subpart W amendments, rather than waiting for the public comment period; and
4. Immediate consultation with EPA on the Air Technical Enforcement Program's decision not to pursue an enforcement action on the alleged (Radon-222 emissions and number of impoundments) violations.

Thanks,

Jasmine

Jasmine M. Saldenha
Associate Regional Counsel | USEPA Region 8|RC
303.312.6639| saldenha.jasmine@epa.gov

ATTORNEY-CLIENT PRIVILEGE
DELIBERATIVE; CONFIDENTIAL

From: Mitre, Alfreda
Sent: Thursday, March 20, 2014 3:20 PM
To: Saldenha, Jasmine
Subject:

Below are the four main things the Ute Mountain Ute is requesting from EPA:

5. Remove the mill from the list to accept alternative feed until the three oldest cells are reclaimed and the environmental impacts are addressed;
6. In Off-Site Rule determination, make the process for making a decision more robust;

7. Immediate consultation with EPA on Subpart W and not wait until the public comment period (Specifically regarding their claim that five Subpart W cells are in operation); and
8. Immediate consultation with EPA on EPA's decision not to pursue enforcement action on radon (and cell number) violations.

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

From: Diaz, Angelique
Sent: Friday, May 02, 2014 10:56 AM
To: Jackson, Scott; Daly, Carl; Shea, Valois; Laumann, Sara; Chin, Lucita; Cosentini, Christina
Subject: FW: Subpart W NPRM

FYI

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Rosnick, Reid
Sent: Friday, May 02, 2014 5:02 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Herrenbruck, Glenna
Cc: Schultheisz, Daniel; Nesky, Anthony; Miller, Beth; Ferguson, Rafaela
Subject: Subpart W NPRM

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

FEDERAL REGISTER

Vol. 79 Friday,
No. 85 May 2, 2014

Part III

Environmental Protection Agency

40 CFR Part 61
Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

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[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ^{7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for groundwater detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

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From: Cherepy, Andrea
Sent: Thursday, May 08, 2014 1:31 PM
To: Gillam, Connie
Cc: Rosnick, Reid
Subject: Subpart W tribal consultation letter & labels

Connie,

Thank you for offering to deal with the labels for the 50 tribal consultation letters. The addresses can be found in the attached Excel spreadsheet. The spreadsheet was set up to assist in using Microsoft's "Mail Merge" feature, which is why you see the addresses tabulated the way they are.

For instructions on using "Mail Merge" to create address labels, please go to:
http://office.microsoft.com/en-us/word-help/mail-merge-for-labels-HA102809780.aspx

I have also attached an electronic version of the letter, just in case any problems come up during signature. I will be out of the office for a few days and don't want to hold up getting these letters mailed.

Thanks again,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

<<AddressBlock>>

<<CorrespondenceBlock>>

On May 2, 2014 the U.S. Environmental Protection Agency proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments,
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
    - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at (202) 343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan D. Edwards
Director
Radiation Protection Division

Firstname & Middle Initia	Lastname	Suffix	Title
Donnie Donald	Cabaniss	Jr.	Chairman
Jim	Shakespear		Chairman
A.T. "Rusty"	Stafne		Chairman
Willie A.	Sharp	Jr.	Chairman
Bill John	Baker		Principal Chief
Janice	Boswell		Governor
Kevin	Keckler Sr		Chairman
Bruce	Sunchild		Chairman
Wallace	Coffey		Chairman
Joe	Durglo		Chairman
Harry	Smiskin		Chairman
Brandon	Sazue		Chairman
Darrin	Old Coyote		Chairman
Anthony	Reider		President
Tracy	King		President
LeRoy	Shingoitewa		Chairman
Wilfred	Whatoname	Sr.	Chairman
Ron	Twohatchet		Chairman
Gordon	Thayer		Chairman
Michael	Jandreau		Chairman
Shannon	Blue		Tribal President
Mark	Chino		President
Ben	Shelly		President
Leroy	Spang		President
Jason	Walker		Chairman
John	Steele		President
Marshall	Gover		President
Rebecca	White	Jr.	Chairperson
Randal	Vicente		Governor
Frank E.	Lujan		Governor
Michael	Toledo	Jr.	Governor
Richard B.	Luarkie		Governor
Malcolm	Montoya		Governor
Rodger	Martinez		President
Cyril L.	Scott		President
Roger	Trudell		Chairman

Ivan D.	Posey		Chairman
Nathan	Small		Chairman
Robert	Shepherd	Sr.	Chairman
Roger	Yankton		Chairman
Charles W.	Murphy		Chairman
Michael	Burgess		Chairman
Ron	Sparkman		Chief
Tex	Hall		Chairman
Merle	St. Clair		Chairman
Manuel	Heart		Chairman
Thurman	Cournoyer		Chairman
Thomas	Beauty		Chairman
Ernest	Jones	Sr.	President
Arlen	Quetawki	Sr.	Governor

Organization	Street	City
Apache Tribe of Oklahoma	P.O. Box 1220	Anadarko
Arapaho Tribe of the Wind River Reservation	P.O. Box 396	Fort Washakie
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	P.O. Box 1027	Poplar
Blackfeet Tribe of the Blackfeet Indian Reservation of Montana	P.O. Box 850, All Chiefs Square	Browning
Cherokee Nation of Oklahoma	P.O. Box 948	Tahlequah
Cheyenne and Arapaho Tribes of Oklahoma	P.O. Box 38	Concho
Cheyenne River Sioux Tribe	P.O. Box 590	Eagle Butte
Chippewa-Cree Indians of the Rocky Boy's Reservation, Montana	RR1, P.O. Box 544	Box Elder
Comanche Nation of Oklahoma	P.O. Box 908	Lawton
Confederated Salish & Kootenai Tribes of the Flathead Rsvn.	P.O. Box 278	Pablo
Confederated Tribes and Bands of the Yakama Nation	P.O. Box 151	Toppenish
Crow Creek Sioux Tribal Council	P.O. Box 50	Fort Thompson
Crow Tribe of Montana	P.O. Box 169	Crow Agency
Flandreau Santee Sioux Executive Committee	P.O. Box 283	Flandreau
Fort Belknap Indian Community of the Fort Belknap Reservation of MT	RR1, Box 66	Harlem
Hopi Tribe of Arizona	P.O. Box 123	Kykotsmovi
Hualapai Tribal Council	P.O. Box 179	Peach Springs
Kiowa Indian Tribe of Oklahoma	P.O. Box 369	Carnegie
Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin	13394 West Trepania Road	Hayward
Lower Brule Sioux Tribal Council	187 Oyate Circle	Lower Brule
Lower Sioux Indian Community of Minnesota	P.O. Box 308	Morton
Mescalero Apache Tribe	P.O. Box 227	Mescalero
Navajo Nation	P.O. Box 7440	Window Rock
Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montar	P.O. Box 128	Lame Deer
Northwestern Band of the Shoshoni Nation	505 Pershing Avenue, Suite 200	Pocatello
Oglala Sioux Tribal Council	P.O. Box 2070	Pine Ridge
Pawnee Nation of Oklahoma	P.O. Box 470	Pawnee
Ponca Tribe of Nebraska	P.O. Box 288	Niobrara
Pueblo of Acoma, New Mexico	P.O. Box 309	Acoma
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Pueblo of Jemez, New Mexico	P.O. Box 100	Jemez Pueblo
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Turtle Mountain Band of Chippewa	P.O. Box 900	Belcourt
Ute Mountain Tribe of the Ute Mountain Reservation, CO, NM & UT	P.O. Box 248	Towaoc
Yankton Sioux Tribe of South Dakota	P.O. Box 248	Marty
Yavapai-Apache Nation Council	2400 W. Datsi	Camp Verde
Yavapai-Prescott Indian Tribe	530 E Merritt	Prescott
Zuni Tribe of the Zuni Reservation	P.O. Box 339	Zuni

State	State 2	ZIP
Oklahoma	OK	73005-1330
Wyoming	WY	82514
Montana	MT	59255
Montana	MT	59417
Oklahoma	OK	74465
Oklahoma	OK	73022
South Dakota	SD	57625
Montana	MT	59521
Oklahoma	OK	73502
Montana	MT	59855
Washington	WA	98948-0151
South Dakota	SD	57339
Montana	MT	59022
South Dakota	SD	57028
Montana	MT	59526
Arizona	AZ	86039
Arizona	AZ	86434
Oklahoma	OK	73015
Wisconsin	WI	54843
South Dakota	SD	57548
Minnesota	MN	56270
New Mexico	NM	88340
Arizona	AZ	86515
Montana	MT	59043
Idaho	ID	83201
South Dakota	SD	57770
Oklahoma	OK	74058
Nebraska	NE	68760
New Mexico	NM	87034
New Mexico	NM	87022
New Mexico	NM	87024
New Mexico	NM	87026
New Mexico	NM	87004
New Mexico	NM	87321
South Dakota	SD	57570
Nebraska	NE	68760-7219

Wyoming	WY	82514
Idaho	ID	83203-0306
South Dakota	SD	57262
North Dakota	ND	58335
North Dakota	ND	58538
Oklahoma	OK	73507
Oklahoma	OK	74355
North Dakota	ND	58763-97402
North Dakota	ND	58316
Colorado	CO	81334-0248
South Dakota	SD	57380-1153
Arizona	AZ	86322
Arizona	AZ	86301-2038
New Mexico	NM	87327

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Office of General Counsel
U.S. Environmental Protection Agency
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202-564-5603 (fax)
stahle.susan@epa.gov

From: Cherepy, Andrea
Sent: Thursday, May 08, 2014 1:31 PM
To: Gillam, Connie
Cc: Rosnick, Reid
Subject: Subpart W tribal consultation letter & labels

Connie,

Thank you for offering to deal with the labels for the 50 tribal consultation letters. The addresses can be found in the attached Excel spreadsheet. The spreadsheet was set up to assist in using Microsoft's "Mail Merge" feature, which is why you see the addresses tabulated the way they are.

For instructions on using "Mail Merge" to create address labels, please go to:
http://office.microsoft.com/en-us/word-help/mail-merge-for-labels-HA102809780.aspx

I have also attached an electronic version of the letter, just in case any problems come up during signature. I will be out of the office for a few days and don't want to hold up getting these letters mailed.

Thanks again,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

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Montana	MT	59521
Oklahoma	OK	73502
Montana	MT	59855
Washington	WA	98948-0151
South Dakota	SD	57339
Montana	MT	59022
South Dakota	SD	57028
Montana	MT	59526
Arizona	AZ	86039
Arizona	AZ	86434
Oklahoma	OK	73015
Wisconsin	WI	54843
South Dakota	SD	57548
Minnesota	MN	56270
New Mexico	NM	88340
Arizona	AZ	86515
Montana	MT	59043
Idaho	ID	83201
South Dakota	SD	57770
Oklahoma	OK	74058
Nebraska	NE	68760
New Mexico	NM	87034
New Mexico	NM	87022
New Mexico	NM	87024
New Mexico	NM	87026
New Mexico	NM	87004
New Mexico	NM	87321
South Dakota	SD	57570
Nebraska	NE	68760-7219

Wyoming	WY	82514
Idaho	ID	83203-0306
South Dakota	SD	57262
North Dakota	ND	58335
North Dakota	ND	58538
Oklahoma	OK	73507
Oklahoma	OK	74355
North Dakota	ND	58763-97402
North Dakota	ND	58316
Colorado	CO	81334-0248
South Dakota	SD	57380-1153
Arizona	AZ	86322
Arizona	AZ	86301-2038
New Mexico	NM	87327

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stahle.susan@epa.gov

From: Miller, Beth
Sent: Thursday, May 08, 2014 9:28 AM
To: Rosnick, Reid
Subject: docket contents

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

Document Search Results

Docket Id	Document Id	Title	Date Received	Phase	Typ
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0001	National Emission Standards: Radon Emissions from Operating Mill Tailings	05/02/2014	Posted	PROPOSE RULES
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0002	Surface Water Hydrology Considerations in predicting radon releases from water-covered areas of uranium tailings ponds	11/17/2009	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0003	Radon releases from Austrailian uranium mining and millng projects: assessing the UNSCEAR approach	11/17/2009	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0004	Minutes from December 3, 2009 stake holder conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0005	Minutes from January 5, 2010 conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0006	Minutes from April 6, 2010 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0007	Minutes from July 6, 2010 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0008	Minutes from October 5, 2010 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0009	Minutes from January 5, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0010	Minutes from April 7, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0011	Minutes from July 7, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0012	Minutes from October 6, 2011 stakeholders conference call	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0013	April 26, 2007 Notice of Intent to sue	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0014	Civil Suit filed against USEPA for failure to review/revise Subpart W in a timely fashion	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0015	History of NESHAPS and Subpart W Report 9/25/2008	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0016	Tailings Impoundment Technologies Report 9/25/2008	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0017	Review of Method 115 Report 9/25/2008	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0018	Radon Flux Measurements on Gardinier and Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida [EPA-520/5-85-029] January 1986	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0019	Quality Assurance Project Plan (QAPP)	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0020	2009 Settlement Agreement between EPA and Plaintiffs	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0021	Letter to plaintiffs regarding settlement agreement on November 3, 2009	01/04/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0022	Work Plan for Risk Assessments	01/05/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0023	Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment for Lincoln Park/Cotter Uranium Mill	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0024	Comments by Steven H. Brown, CHP, SENES Consultants Limited 11/7/2010	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0025	NRC/NMA Uranium Recovery Workshop	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0026	National Mining Association 2008	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0027	Meeting material from presentation in Canon City, Colorado - June 30, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0028	National Mining Association 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0029	Meeting material from presentation in Rapid City, South Dakota - October 1, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0030	Notes from meeting with National Mining Association	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0031	National Mining Association 2010	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0032	NESHAP Subpart W Activities An Internet Webinar - National Webinar	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0033	Tuba City Arizona Uranium Stakeholders	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0034	Uranium Recovery Workshop April 29 - 30, 2008	01/05/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0035	Uranium Recovery Workshop April 29 - 30, 2008	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0036	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0037	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0038	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0039	Uranium Recovery Workshop July 1-2, 2009	01/05/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0040	National Emission Standards for Hazardous Air Pollutants; Standards for Radionuclides April 6 1983 Proposed Rule	01/06/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0041	Federal Register 40 CFR Part 61 192.32 a	01/06/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0042	October 31, 1984 ANPR Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0043	40 CFR Part 61 General Requirements	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0044	Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings [EPA 520/1-86-009]	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0045	National Emission Standards for Hazardous Air Pollutants (NESHAPs), Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings. September 24, 1986 Final Rule	01/09/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0046	Draft Environmental Impact Statement (EIS) for Proposed NESHAPS for Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0047	March 7, 1989 Proposed Rule, National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0048	Risk Assessment Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (1)	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0049	Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (2)	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0050	Risk Assessments Methodology, Environmental Impact Statement (EIS), NESHAPS for Radionuclides (3)	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0051	December 15, 1989 Final Rule, National Emission Standards for Hazardous Air Pollutants; Radionuclides	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0052	Method 115- Monitoring for Radon-222 Emissions	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0053	Subpart T Rescission	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0054	40 CFR Part 61 192.32 a Errata	01/09/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0055	40 CFR Part 61 General Requirements Errata	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0056	EPA Procedures for Determining Confidential Business Information	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0057	October 17 2000 Errata	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0058	NRC's In-Situ Leach Facility Standard Review Plan	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0059	IAEA Uranium Mill Tailings Report	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0060	USEPA Contract Number EP-D-05-002	01/09/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0061	Letter to Angelique Diaz, USEPA from Frank Filas, Environmental Manager, Energy Fuels Resources Corporation on August 31, 2010	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0062	Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0063	Evaporation Pond Design Report Pinon Ridge Project Montrose County, Colorado	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0064	Letter to Energy Fuels Resources Corporation from Steven H. Brown, SENES Consultants Limited on August 30, 2010	01/10/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0065	Raffinate Characterization Pinon Ridge Mill Montrose County, Colorado	01/10/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0066	Section 114 Letters/Responses	01/13/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0067	Comparison of CAP88 calculations from SC&A and the EPA web version of CAP88	01/26/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0068	Sheep Mountain Uranium Project	02/07/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0069	Status of Cell 3 at the White Mesa mill	02/07/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0070	Construction of An Environmental Radon Monitoring System Using CR-39 Nuclear Track Detectors	04/18/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0071	Letter from Kennecott Uranium Company to Mr. Reid Rosnick	05/02/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0072	Surface Water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0073	Uranium Mill Tailings Radon Flux Calculations	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0074	Radon Emissions from Tailings and Evaporation Ponds	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0075	Minutes from January 5, 2012 Conference Call	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0076	Minutes from April 5, 2012 Conference Call	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0077	Colorado Citizens Against Toxic Waste (CCAT) Concerns about Cotter Uranium Mill	05/31/2012	Posted	SUPPORT & RELATE MATERIA

EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0078	November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0079	Risk Assessment Model Selection Methodology	05/31/2012	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0080	Minutes from July 5, 2012	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0081	Minutes from October 4, 2012	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0082	Minutes from January 3, 2013 conference call	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0083	Minutes from April 3, 2013	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0084	Minutes from July 11, 2013	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0085	Experimental Determination of Radon Fluxes over Water	07/29/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0086	Subpart W-EIA-BID	07/30/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0087	Risk Assessment Revision for 40 CFR Part 61 Subpart W â€“	09/12/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0088	Record of Communication, May 16, 2013	09/17/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0089	Subpart W Stakeholders Conference Call of October 17, 2013	10/24/2013	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0090	Subpart W Stakeholders Conference Call of January 2, 2014	01/07/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0091	Meeting presentation to Office of Management and	01/09/2014	Posted	SUPPORT & RELATE MATERIA

		Budget by members of the National Mining Association			
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0092	Subpart W Interagency comments under EOs 12866 and 13563	01/13/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0093	OMB questions on BID EIA	01/13/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0094	E.O. 12866 review - draft	01/13/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0095	Recommended Procedures for Measuring Radon Fluxes from Disposal Sites for Residual Radioactive Materials	02/12/2014	Posted	SUPPORT & RELATE MATERIA
EPA-HQ-OAR-2008-0218	EPA-HQ-OAR-2008-0218-0096	Subpart W Stakeholders Conference Call	04/22/2014	Posted	SUPPORT & RELATE MATERIA

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

From: Cherepy, Andrea
Sent: Wednesday, May 07, 2014 10:58 AM
To: Colon, Toni
Cc: Harrison, Jed; Peake, Tom; Rosnick, Reid; Edwards, Jonathan; Perrin, Alan
Subject: Subpart W generic tribal consultation letter

Toni,

The Office of Radiation and Indoor Air recently proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule (Subpart W); the proposal was published in the Federal Register on Friday, May 2.

I am writing to you to request your assistance in posting the attached letter to TCOTS and in sending the letter out to the 51 tribes listed below. It's my understanding that you have the ability to use Microsoft's "Mail Merge" feature to automatically address the letter. We would really appreciate your help in this effort.

If it is easier for you to share the file with the address information, we can perform the mail merge here in our office.

Again, thank you for your assistance,
Andrea
(202) 343-9317

Federally-listed tribes to receive the consultation letter on Subpart W:

- Navajo Nation
- Hopi
- Acoma Pueblo
- Laguna
- Cherokee Nation
- Ute Mountain Ute
- Northern Shoshoni
- Oglala Sioux
- Cheyenne River Sioux

- Standing Rock Sioux
- Ponca Tribe of Nebraska
- Flandreau Santee Sioux
- Lower Brule Sioux
- Sisseton-Wahpeton Sioux
- Apache Tribe of Oklahoma
- Blackfeet Tribe
- Cheyenne and Arapaho Tribes
- Yankton Sioux
- Lakota Sioux
- Ramah Navajo
- Zuni Pueblo
- Isleta Pueblo
- Mescalero Apache Tribe
- Sandia Pueblo
- White Mountain Apache Tribe
- Jemez Pueblo
- Tohajiilee
- Canocito
- Yavapai Apache Tribe of Camp Verde
- Yavapai Prescott Indian Tribe
- Hualapai Tribe
- Crow Tribe of Montana
- Chippewa Cree
- Comanche
- Crow Creek Sioux
- Confederated Salish and Kootenai
- Eastern Shoshoni
- Fort Peck Assiniboine/Sioux
- Kiowa Tribe of Oklahoma
- Fort Belknap
- Lower Sioux
- Northern Arapaho
- Northern Cheyenne
- Rosebud Sioux
- Pawnee Nation of Oklahoma
- Santee Sioux Nation
- Shawnee
- Shoshoni-Bannock
- Spirit Lake Tribe
- Turtle Mountain Chippewa
- Three Affiliated Tribes

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

<<AddressBlock>>

Dear Tribal Leader:

On May 2, 2014 the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
  - conventional tailings impoundments,
  - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
  - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
  - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
  - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
  - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at 202-343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

/s/ Jonathan Edwards, Director
Radiation Protection Division

From: Rosnick, Reid
Sent: Wednesday, May 07, 2014 8:43 AM
To: Cherepy, Andrea
Subject: FW: Form Letter for Tribal Consultation

Completed.

From: Peake, Tom
Sent: Wednesday, May 07, 2014 8:41 AM
To: Rosnick, Reid
Subject: RE: Form Letter for Tribal Consultation

Looks good to me. Add a space between 2014 and the.
On May 2, 2014the U.S. Environmental Protection Agency

From: Rosnick, Reid
Sent: Friday, May 02, 2014 9:08 AM
To: Peake, Tom
Subject: Form Letter for Tribal Consultation

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

The Honorable Ben Shelly
President, Navajo Nation
P.O. Box 7440
Window Rock, AZ 86515

Dear President Shelly:

On May 2, 2014 the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments,
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
    - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.

- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at 202-343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Steve Etsitty, NNEPA

From: Stahle, Susan
Sent: Monday, May 05, 2014 9:10 AM
To: Blake, Wendy
Subject: FW: Subpart W NPRM

FYI. This was published on Friday. This starts a 90 day public comment period.

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

From: Rosnick, Reid
Sent: Friday, May 02, 2014 7:24 AM
To: Stahle, Susan
Subject: Subpart W NPRM

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

FEDERAL REGISTER

Vol. 79 Friday,

No. 85 May 2, 2014

Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

• *www.regulations.gov*: Follow the on-line instructions for submitting comments.
• *Email: a-and-r-docket@epa.gov.*
• *Fax:* 202–566–9744.
• *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
• *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m²/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ⁷ cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m²/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m²/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m²/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m²/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment; [29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for groundwater contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 $pCi/m^2/sec$.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ‘‘significant energy action’’ as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (‘‘NTTAA’’), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Rosnick, Reid
Sent: Friday, May 02, 2014 12:55 PM
To: Miller, Beth
Subject: RE: Subpart W and homepage posted

I can give you the document if you want to link to that.

From: Miller, Beth
Sent: Friday, May 02, 2014 12:54 PM
To: Rosnick, Reid
Subject: RE: Subpart W and homepage posted

Yeah that's what I am trying to find do you have it handy.

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Friday, May 02, 2014 12:53 PM
To: Miller, Beth
Subject: RE: Subpart W and homepage posted

Beth,

There is no link to the FR notice

From: Miller, Beth
Sent: Friday, May 02, 2014 12:51 PM
To: Nesky, Anthony; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: Subpart W and homepage posted

http://www.epa.gov/radiation/

http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

FEDERAL REGISTER

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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

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[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ^{7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

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[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 $pCi/m^2/sec$.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Dye, Robert
Sent: Friday, May 02, 2014 10:59 AM
To: Jay, Michael; Tapp, Joshua; Smith, John
Cc: Algoe-Eakin, Amy; Hooper, Charles A.
Subject: FW: NESHAP Subpart W FR Notice
Importance: High

This was posted today.

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From: Ferguson, Rafaela
Sent: Friday, May 02, 2014 9:54 AM
To: Aquino, Marcos; BANDROWSKI, MIKE; Barnette, Jack; Barry, Michael; Brozowski, George; Button, Rich; Compher, Michael; Croke, Harriet; Debonis, Michael; Dettling, Diane; Diaz, Angelique; Dye, Robert; Febbo, carol; Generette, Lloyd; Giardina, Paul; Graham, Richard; Honnellio, Anthony; Hooper, Charles A.; Knutson, Lingard; Koehler, Larainne; Murphy, Michael; Povetko, Oleg; Richards, Jon M.; Rinck, Todd; Rosenblum, Shelly; Schulingkamp, Cristina; Snowbarger, Robert; Terry, Robert; Mahler, Tom; Tyson, MaryPat; Wagner, Christine; Waldon, MARGARET; Wood, Periann; Zhen, Davis
Cc: Rosnick, Reid
Subject: NESHAP Subpart W FR Notice
Importance: High

Good Morning Everyone,

Attached is the FR Notice for NESHAP Subpart W. Have a good weekend. Give Reid a call if you have any questions, 202-343-9563.

Rafie

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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html*.

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

> 1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
>
> 2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ^{7} cm/sec.
>
> 3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m²/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Ferguson, Rafaela
Sent: Friday, May 02, 2014 10:54 AM
To: Aquino, Marcos; BANDROWSKI, MIKE; Barnette, Jack; Barry, Michael; Brozowski, George; Button, Rich; Compher, Michael; Croke, Harriet; Debonis, Michael; Dettling, Diane; Diaz, Angelique; Dye, Robert; Febbo, carol; Generette, Lloyd; Giardina, Paul; Graham, Richard; Honnellio, Anthony; Hooper, Charles A.; Knutson, Lingard; Koehler, Larainne; Murphy, Michael; Povetko, Oleg; Richards, Jon M.; Rinck, Todd; Rosenblum, Shelly; Schulingkamp, Cristina; Snowbarger, Robert; Terry, Robert; Mahler, Tom; Tyson, MaryPat; Wagner, Christine; Waldon, MARGARET; Wood, Periann; Zhen, Davis
Cc: Rosnick, Reid
Subject: NESHAP Subpart W FR Notice
Importance: High

Good Morning Everyone,

Attached is the FR Notice for NESHAP Subpart W. Have a good weekend. Give Reid a call if you have any questions, 202-343-9563.

Rafie

Rafaela Ferguson
Special Assistant/Regional Coordinator
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Office of Radiation and Indoor Air
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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html*.

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m²/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m²/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m²/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ‘‘significant energy action’’ as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (‘‘NTTAA’’), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Rosnick, Reid
Sent: Friday, May 02, 2014 9:08 AM
To: Peake, Tom
Subject: Form Letter for Tribal Consultation

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

The Honorable Ben Shelly
President, Navajo Nation
P.O. Box 7440
Window Rock, AZ 86515

Dear President Shelly:

On May 2, 2014the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments,
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
    - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.

- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about July 31, 2014. A public hearing will be held in Denver, Colorado on June 16 and 17, 2014. If you wish to initiate consultation with the EPA on this rule, or wish to participate in a webinar we are planning, please contact Anthony Nesky at 202-343-9597. Please contact us by June 1, 2014 in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Steve Etsitty, NNEPA

From: Rosnick, Reid
Sent: Friday, May 02, 2014 9:08 AM
To: Cherepy, Andrea
Subject: Subpart W NPRM

Sorry, I thought I put you on the distribution list.

____

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FEDERAL REGISTER

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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

• *www.regulations.gov*: Follow the on-line instructions for submitting comments.
• *Email: a-and-r-docket@epa.gov.*
• *Fax:* 202–566–9744.
• *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
• *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m²/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html.*

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.

2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10^{7} cm/sec.

3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

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[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

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[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Rosnick, Reid
Sent: Friday, May 02, 2014 7:24 AM
To: Stahle, Susan
Subject: Subpart W NPRM

____
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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

• *www.regulations.gov*: Follow the on-line instructions for submitting comments.

• *Email: a-and-r-docket@epa.gov.*

• *Fax:* 202–566–9744.

• *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.

• *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

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[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html*.

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m²/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10 ^{7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ‘‘generic’’ sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

> *Standby* means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

> *Operation* means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Rosnick, Reid
Sent: Friday, May 02, 2014 7:02 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Herrenbruck, Glenna
Cc: Schultheisz, Daniel; Nesky, Anthony; Miller, Beth; Ferguson, Rafaela
Subject: Subpart W NPRM

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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

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[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html*.

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second (pCi/m^2/sec). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m²/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.

2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1 x 10^{7} cm/sec.

3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m²/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ''generic'' sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

> ''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;
- Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for groundwater contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

From: Nesky, Anthony
Sent: Wednesday, April 30, 2014 2:12 PM
To: Miller, Beth
Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: Updates for Subpart W page for Friday

Dear Beth:

As you know, Subpart W will be published in the Federal Register on Friday. Please see the attached Word document for revisions to the webpage, which we want to post as soon as we hear that Subpart W has appeared in the Federal Register.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Subpart W Rulemaking Activity

NESHAP Subpart W is a radon emission standard for operating uranium mill tailings. In accordance with the Clean Air Act Amendments of 1990, EPA formed a workgroup to review the standard.

EPA will provide up-to-date information on recent or upcoming conference calls, resources, public hearings and contact information. Please check back regularly, as more items will be added.

Get e-mail updates when this information changes.

EPA is proposing revisions to Subpart W. Comments due on 07/31/2014

EPA has released a Notice of Proposed Rulemaking that would revise "National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. Comments must be received in writing by___

In addition, EPA will conduct a hearing where members of the public may provide testimony or verbal comments. Please check back regularly; details and instructions will be added to this page as soon as they are available.

Top of page

Download the Proposed Rule and Submit Comments on Line

- Notice of Proposed Rulemaking from the Federal Register.
- Fact Sheet on the Proposed Rule (2 pp, 52 K, About PDF)
- Submit Comments on line at Regulations.gov (Note: Comments may also be submitted by mail, see the Notice of Proposed Rulemaking for instructions)

Note: Continue he rest of the Subpart W page as-is, starting with "Conference Call Information".

UPDATE TO THE RPD HOME PAGE--

Regulations Under Review

- New! National Emission Standards for Hazardous Air Pollutants (NESHAPs)-Radon from Operating Uranium Mill Tailings EPA has released a Notice of Proposed Rulemaking that would revise "National Emission Standards for Radon Emissions from Operating Mill Tailings," Subpart W of 40 CFR Part 61. The public is invited to submit comments on the proposed rulemaking. Comments must be received in writing by___

OAR User Community,

As announced in Bob Perciasepe's memo below, Quarterly Records Management Day is scheduled for Wednesday, June 25, 2014.

This will be a great opportunity for OAR staff to show our commitment to the management of paper records. With OAR/HQs experiencing internal office moves and others requiring removal, recycling, and organizing of files, the timing could not have been more appropriate—plus it gives us a golden opportunity to put records management to the test. While our greater focus should be paper records, let me use this opportunity to reemphasize our need to continue saving email records electronically using the EZ Email records tool.

If you have any questions regarding this Agency-wide effort, you may contact Shawn Stingel, OAR's Records Liaison Officer (RLO) or the Records Team member within your office. Their contact information is listed below:

Office	Name and Phone
OAR-IO/OPMO	Shawn Stingel (RLO) 202-564-1503
OTAQ	Tanya Meekins 202-564-6002
OTAQ-Ann Arbor	Patricia Paff 734-214-4016
OAQPS	Maria Sanders 919-541-5619
OAP-IO	Walter Kerns 202-343-9187
OAP-SPD	Robert Burchard 202-343-9126
OAP-CAMD	Andy Dupont 202-343-9092
OAP-CPPD	Jane Kurtz 202-343-9304
OAP-CCD	Anne Hargrove 202-343-9926
ORIA	Kia Logan 202-343-9285
ORIA-NAREL	Charles Petko 334-270-3411
ORIA-NCRFO	Alejandra Baer 702-784-8281

Many thanks for honoring your responsibilities in support of EPA's Records Management Program!

Reginald Slade
Team Leader/IMO
Program Management Operations, OAR

From: Mass Mailer [mailto:Mass_Mailer@epa.gov]
Sent: Wednesday, June 18, 2014 12:54 PM
To: All Users of EPA Email
Subject: Message from the Deputy Administrator: Third Quarter Records Management Day will be June 25, 2014
Importance: High

MEMORANDUM

FROM: Bob Perciasepe

TO: All EPA Employees

SUBJECT: Third Quarter Records Management Day will be June 25, 2014

One week from today, on Wednesday, June 25, 2014, EPA will hold its third Quarterly Records Management Day. Please mark your calendars and plan to set aside a few hours to manage your records. The focus of this Quarterly Records Management Day is managing our paper records. As space consolidation efforts occur throughout the agency, we must ensure that our paper records are managed appropriately. June 25th will be a day devoted to clean up and organize paper records.

In addition, you should continue to use the EZ Email Records tool to save your email records from Lotus Notes, Outlook, and the Outlook Web Application (OWA). Saving your email records electronically reduces the agency's use of paper, one of the priority actions from EPA's GreenSpark Sustainability Challenge (http://intranet.epa.gov/greenspark/challenge/index.html).

Records management is a responsibility we all share. It allows us to do our jobs in a more efficient and effective manner. Records management is also a vital part of EPA's commitment to transparency and openness, which is a pledge that we all are obligated to take seriously. Please use June 25th as an opportunity to focus on this important requirement.

For more information about the third Quarterly Records Management Day – including information on how to organize paper records – please see: http://intranet.epa.gov/records/cleanup.pdf.

If you have any question about records, please contact your Records Liaison Officer (RLO). A list of RLOs is available at http://intranet.epa.gov/records/contact_us.html.

For more information about the National Records Management Program, please visit: http://intranet.epa.gov/records/.

Subpart W Rulemaking Activity

NESHAP Subpart W is a radon emission standard for operating uranium mill tailings. In accordance with the Clean Air Act Amendments of 1990, EPA formed a workgroup to review the standard.

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Get e-mail updates when this information changes.

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From: Cherepy, Andrea
Sent: Wednesday, April 23, 2014 11:48 AM
To: Harrison, Jed
Cc: Rosnick, Reid
Subject: tribal consultation letter

Jed,

The Subpart W proposal has been signed and will be published in the Federal Register any day now. Reid Rosnick has prepared a tribal consultation letter that closely follows the examples provided in the Tribal Consultation Handbook. Jon Edwards has asked that we run the letter by you before it gets sent out.

Can you please review the attached letter and provide any comments to both Reid and me (I'll be out of the office on Thurs. and Fri.)?

Thank you,
Andrea

Andrea Cherepy | U.S. Environmental Protection Agency | Office of Air and Radiation | Radiation Protection Division | Tel 202 343 9317 | cherepy.andrea@epa.gov

Manuel Heart, Chairman
Ute Mountain Ute Tribe
P.O. Box 6
Towaoc, CO 81334

Dear Chairman Heart:

On ***DATE***, the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. Subpart W protects the public and the environment from the emission of radon-222 from uranium mills and their associated tailings. The purpose of this letter is to invite you to consult on EPA's proposal.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
  - conventional tailings impoundments,
  - evaporation ponds or other nonconventional impoundments at uranium recovery facilities, and
  - heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
  - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
  - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
  - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.

- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about ***DATE***. A public hearing will be held in Denver, Colorado on ***DATE***. If you wish to initiate government to government consultations with the EPA on this rule, please contact __________------. Please contact us by______in order to request formal consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Tribal Environmental Director
Tribal Environmental Staff

From: Rosnick, Reid
Sent: Tuesday, April 22, 2014 10:41 AM
To: Miller, Beth
Subject: Addition

Hi again, Beth,

I have another favor. Will you please post the attachment on the Subpart W website? Post it at the bottom of the Current Action section and call it: **Background Information Document and Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking.** Thanks, I think this is it for today ☺

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills
(40 CFR 61.250)

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
February 2014

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ACRONYMS AND ABBREVIATIONS

ACE	Army Corps of Engineers
AEA	Atomic Energy Act
AIRDOS	AIR DOSe
ALARA	as low as reasonably achievable
AMC	American Mining Congress
ANPR	Advance Notice of Proposed Rulemaking
$BaCl_2$	barium chloride
BEIR	Biological Effects of Ionizing Radiation
BID	background information document
CAA	Clean Air Act
CAP88	Clean Air Act Assessment-1988
CFR	*Code of Federal Regulations*
CHP	certified health physicist
Ci/yr	curies per year
cm	centimeter
cm/sec	centimeter per second
cm^2/sec	square centimeter per second
CPI	consumer price index
CPP	Central Processing Plant
DARTAB	Dose And Risk TABulation
DOE	Department of Energy
EDF	Environmental Defense Fund
EIA	Energy Information Administration
EIS	environmental impact statement
EPA	Environmental Protection Agency
E-PERM	Electric Passive Environmental Radon Monitor
FGR	Federal Guidance Report
FR	*Federal Register*
ft	feet
g/cc	gram per cubic centimeter
G&A	general and administrative

GACT	generally available control technology
GCL	geosynthetic clay liner
GHG	Greenhouse Gas
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HRTM	Human Respiratory Tract Model
ICRP	International Commission on Radiological Protection
in/yr	inches per year
ISL	in-situ leach
ISR	in-situ recovery
km	kilometer
L	liter
LAACC	large-area activated charcoal collector
lb	pound
LCF	latent cancer fatalities
L/d	liters per day
LLDPE	linear low-density polyethylene
LoC	line of credit
m^2	square meters
m^3/hr	cubic meters per hour
m/sec	meters per second
MACT	maximum achievable control technology
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mi	mile
MIR	maximum individual risk
mph	miles per hour
mrem	millirem
mSv	millisievert
N.C.	not calculated
NESHAP	National Emission Standard for Hazardous Air Pollutants

N.G.	not given
NMA	National Mining Association
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
O&M	operation and maintenance
ORISE	Oak Ridge Institute for Science and Education
pCi	picocurie
pCi/(ft^2-sec)	picocurie per square foot per second
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/(m^2-sec)	picocurie per square meter per second
PIPS	passive implanted planar silicon
POO	Plan of Operation
PVC	polyvinyl chloride
R&D	research and development
Ra	radium
RADRISK	RADiation RISK
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent in man
RMEI	reasonably maximally exposed individual
Rn	radon
RSO	radiation safety officer
SC	Sierra Club
SF	square foot
tpd	tons per day
U	uranium
U_3O_8	triuranium octoxide
UMTRCA	Uranium Mill Tailings Remedial Control Act
WCS	Waste Control Specialists, LLC
WL	working level
WLM	working level month
ZnS(Ag)	silver doped zinc sulfide

1.0 EXECUTIVE SUMMARY

The purpose of this report is to present the reader with an understanding of the facilities being regulated under this National Emission Standard for Hazardous Air Pollutant (NESHAP). The report also presents the technical bases that the Environmental Protection Agency (EPA or the Agency) has used for evaluating the risks from existing facilities and for determining that the prescribed work practice standards represent generally available control technology (GACT), as required by section 112(d) of the 1990 amendments to the Clean Air Act (CAA).

The Agency is also defining the scope of its review of the Subpart W NESHAP to include the waste impoundments at in-situ leach (ISL) uranium recovery facilities and heap leach recovery operations, since all post-1989 impoundments, which potentially contain uranium byproducts, are considered to be under the NESHAP. The Agency has defined the scope of the review to include regulation of the heap leach pile, as it believes the pile contains byproduct material during operations.

1.1 Introduction, History, and Basis

After a brief introduction, this report describes the events that led the Agency to promulgate a NESHAP for radon emissions from operating uranium mill tailings on December 15, 1989, in Section 40 of the *Code of Federal Regulations* (40 CFR) Part 61, Subpart W. The 1977 amendments to the CAA include the requirement that the Administrator of EPA determines whether radionuclides should be regulated under the act. In December 1979, the Agency published its determination in the *Federal Register* (FR) that radionuclides constitute a hazardous air pollutant (HAP) within the meaning of section 112(a)(1). In 1979, the Agency also developed a background information document (BID) to characterize “source categories” of facilities that emit radionuclides into ambient air, and in 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID. On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings, establishing an emission standard of 20 picocuries per square meter per second (pCi/(m^2-sec)) for radon (Rn)-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. Between 1984 and 1986, the Environmental Defense Fund (EDF), the Natural Resources Defense Council (NRDC), the Sierra Club (SC), and the American Mining Congress (AMC) filed various court petitions seeking modifications to the NESHAPs.

In a separate decision, the U.S. District Court for the District of Columbia outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk, and then considering additional factors, such as costs to establish the “ample margin of safety.”

Section 112(q)(1) of the 1990 CAA Amendments requires that certain emission standards shall be reviewed, and if appropriate, revised to comply with the requirements of section 112(d). Subpart W is under review/revision in response to that requirement. Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. In accordance with section 112(d), the Administrator has

elected to promulgate standards that provide for the use of GACT or management practices to regulate radon emissions from uranium recovery facility tailings impoundments noted in Subpart W.

1.2 The Uranium Extraction Industry Today

From 1960 to the mid-1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. In the early years, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. Because of overproduction, the price of uranium rapidly declined in the 1980s. The declining uranium market could not support the existing number of uranium recovery operations, and many of the uranium recovery facilities in the United States were closed, decommissioned, and reclaimed. In the mid- to late 1980s, several uranium recovery projects employing the solution, or ISL, mining process came on line. However, because of a need for clean energy, a need to develop domestic sources of energy, and other reasons, current forecasts predict growth in the U.S. uranium recovery industry over the next decade and continuing into the future.

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. Representative of the extent of the conventional uranium milling operations that currently exist and are licensed in the United States are the mills at Sweetwater, Wyoming; Shootaring Canyon, Utah; and White Mesa, Utah. Only the White Mesa mill is currently in operation. A conventional mill at Piñon Ridge, Colorado, is currently in the planning and licensing stage. Additionally, a total of six potentially new conventional mill facilities are being discussed in New Mexico, Wyoming, Utah, and Arizona.

The radon data for the conventional mill tailings impoundments indicate that the radon exhalation rates from the surfaces are generally within the Subpart W standard of 20 pCi/(m^2-sec), but occasionally the standard may be exceeded. When that occurs, the tailings are usually covered with more soil, and the radon flux is reduced.

Solution, or ISL, mining is defined as the leaching or recovery of uranium from the host rock by chemicals, followed by recovery of uranium at the surface. ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects in the 1980s demonstrated solution mining to be a viable uranium recovery technique. Ten ISL facilities are currently operating (see Table 8, page 33), and about 23 other facilities are restarting, expanding, or planning for new operations.

Uranium is leached into solution through the injection into the ore body of a lixiviant. A lixiviant is a chemical solution used to selectively extract (or leach) uranium from ore bodies where they are normally found underground. The injection of a lixiviant essentially reverses the geochemical reactions that are associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. The liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. Since radium (Ra)-226 is present in the liquid bled from the lixiviant, radon will be generated in and released from the ISL's evaporation/holding ponds/ impoundments. The amount of radon released from these evaporation/holding ponds has been estimated and found to be small. (See Section 3.3.1.)

Heap leaching is a process by which chemicals are used to extract the economic element (for the purposes of Subpart W, uranium) from the ore. A large area of land is leveled with a small gradient, and a liner and collection system are installed. Ore is extracted from a nearby surface or underground mine and placed in heaps atop the liner. A leaching agent (usually an acid) will then be sprayed on the ore. As the leaching agent percolates through the heap, the uranium is mobilized and enters the solution. The solution will flow to the bottom of the pile and then along the gradient into collecting pools, from which it will be pumped to an onsite processing plant. In the past, a few commercial heap leach facilities operated but none is now operating. Planning and engineering have been undertaken for two heap leach facilities, one in Wyoming and the other in New Mexico.

A brief review of Method 115, "Monitoring for Radon-222 Emissions" (40 CFR 61, Appendix B) (SC&A 2008), demonstrated that its use can still be considered current for monitoring radon flux from conventional uranium tailings impoundments. It is not an option for measuring radon emissions from evaporation or holding ponds because there is no solid surface on which to place the monitors.

1.3 Current Understanding of Radon Risk

A description of how the understanding of the risk presented by radon and its progeny has evolved since the 1989 BID was published examines three parameters: (1) the radon progeny equilibrium fraction, (2) the epidemiological risk coefficients, and (3) the dosimetric risk coefficients. Additionally, SC&A (2011) used the computer code CAP88 version 3.0 (Clean Air Act Assessment Package-1988) to analyze the radon risk from eight operating uranium recovery sites, plus two generic sites.

The lifetime (i.e., 70-year) maximum individual risk (MIR)[1] calculated using data from eight actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments, while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments. (SC&A 2011)

To protect public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to a lifetime MIR of approximately 1 in 10 thousand (i.e., 10^{-4}). Although the calculated high end of the lifetime MIR range is above 10^{-4}, there are several mitigating factors. First, the highest MIR was calculated for a hypothetical mill at an eastern generic site. If an actual mill were to be located at the Eastern Generic site, it would be required to reduce its radon

[1] In this BID all risks are presented as mortality risks. If it is desired to estimate the morbidity risk, simply multiply the mortality risk by 1.39.

emissions as part of its licensing commitments. Also, the assumptions that radon releases occur continuously for 70 years and that the same reasonably maximally exposed individual (RMEI) is exposed to those releases for the entire 70 years are very conservative.

Likewise, the risk assessment estimated that the risk to the population from all eight real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 kilometers (km) of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km (50 miles) was 0.0043, which was less than one case every 200 years, for existing impoundments and 0.014, or approximately one case every 70 years, for new impoundments.

1.4 Evaluation of Subpart W Requirements

EPA has determined that radon releases from uranium recovery facilities are HAPs, as defined by the CAA. Furthermore, no radionuclide (including radon) releases have met the CAA's definition of major sources, and thus radon releases from uranium recovery facilities are classified as area sources. (See Section 5.3.) Under section 112(d) of the CAA, the EPA Administrator may elect to promulgate standards or requirements applicable to area sources that provide for the use of GACTs or management practices to reduce emissions of HAPs. For the four source categories of radon releases from uranium recovery facilities, the Administrator has elected to promulgate GACTs as follows:

Conventional Impoundments – Constructed on or before December 15, 1989

GACT The flux standard of 20 pCi/(m^2-sec) contained in the current 40 CFR 61.252(a) will no longer be required; require that these conventional impoundments be operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Conventional Impoundments – Constructed after December 15, 1989

GACT Retain the standard that conventional impoundments be designed, constructed, and operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Nonconventional Impoundments – Where uranium byproduct material (i.e., tailings) are contained in ponds and covered by liquids

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restrictions, and require that during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

Heap Leach Piles

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), and require that the moisture content of the operating heap be maintained at or greater than 30 percent.

Additionally, the analyses provided in this BID support the following findings:

- Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.
- By requiring that conventional impoundments be designed, constructed, and operated to meet one of two 40 CFR 61.252(b) work practices (i.e., phased disposal and continuous disposal), adoption of an emission limit (e.g., 20 pCi/(m^2-sec)) is not necessary to protect public health.
- The requirement that conventional impoundments use either phased or continuous disposal technologies is appropriate to ensure that public health is protected with an ample margin of safety, and is consistent with section 112(d) of the 1990 CAA Amendments that require standards based on GACT.
- The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures/facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

1.5 Economic Impacts

The economic impact analysis to support any potential revision of the Subpart W NESHAP is presented in four distinct areas:

(1) A review and summary of the original 1989 economic assessment and supporting documents are provided.

(2) The baseline economic costs for development of new conventional mills, ISL facilities, and heap leach facilities are developed and presented.

(3) The anticipated costs to the industries versus the environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

(4) Finally, information is provided on the economic impacts to disadvantaged and tribal populations and on environmental justice.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For conventional mills, data from the proposed new mill at the Piñon Ridge project in Colorado were used. Data from two proposed new ISL facilities were used; the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14 to 15-year production period,

which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Table 1 summarizes the unit cost (dollars per pound) estimates for all four uranium recovery facilities. As shown, on a unit cost basis, heap leach facilities are projected to be the least expensive, and the two ISL facilities the most expensive.

Table 1: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC	w/o LoC
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87

Because the four proposed GACTs are not expected to change the manner in which any of the uranium recovery facilities are designed, built, or operated, no additional economic benefits or costs are associated with the proposed Subpart W revisions.

At 10 of the 15 existing or proposed uranium recovery sites analyzed, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is white exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either African-American or Other is less than the national norm, while the percentage of African-Americans and Others is less than the regional norm at all but one site. The analysis found that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are more economically advantaged (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the United States' 50th percentile. On the other hand, five sites are located in areas where the per capita nonfarm wealth is below the country's 10th percentile.

2.0 INTRODUCTION, HISTORY, AND BASIS

On December 15, 1989, EPA promulgated a NESHAP for radon emissions from operating uranium mill tailings (40 CFR 61, Subpart W). Section 112(q) of the CAA, as amended, requires EPA to review, and if appropriate, revise or update the Subpart W standard on a timely basis (within 10 years of passage of the CAA Amendments of 1990). Soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically. However, recent developments in the market for uranium have led to some companies expressing their intention to pursue licensing of new facilities, and therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations before these proposed facilities become operational.

Two separate standards are defined in Subpart W. The first states that existing sources (facilities constructed before December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) or 1.9 picocuries per square foot per second (pCi/(ft^2-sec)) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA showing the results of the compliance monitoring. The second Subpart W standard prescribes that for new sources (facilities constructed on or after December 15, 1989), no new tailings impoundment can be built unless it is designed, constructed, and operated to meet one of the two following work practices:

(1) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) as determined by the U.S. Nuclear Regulatory Commission (NRC). The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

(2) Continuous disposal of tailings such that tailings are dewatered and immediately disposed of with no more than 10 acres uncovered at any time and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The work practice standard also applies to operations at existing sources, once their existing impoundments can no longer accept additional tailings.

The facilities covered by Subpart W are uranium recovery facilities, also licensed and regulated by the NRC or its Agreement States. The NRC becomes involved in uranium recovery operations once the ore is processed and chemically altered. This occurs either in a uranium mill (the next step from a conventional mine) or during ISL or heap leach. For this reason, the NRC regulates ISL facilities, as well as uranium mills and the disposal of liquid and solid wastes from uranium recovery operations (including mill tailings), but does not regulate the conventional uranium mining process. The NRC regulations for the protection of the public and workers from exposure to radioactive materials are found in 10 CFR 20, while specific requirements for the design and operation of uranium mills and disposition of tailings are found in 10 CFR 40, Appendix A.

2.1 Document Contents and Structure

This report is divided into six sections. The first two sections are the Executive Summary and this introduction, which includes discussions of the history of the development of Subpart W (Section 2.2) and the basis for the 1989 risk assessments (Section 2.3). Four technical sections, the contents of which are summarized below, follow this introductory section.

2.1.1 The Uranium Extraction Industry Today

After a brief history of the uranium market, Section 3.0 identifies both the uranium recovery facilities that are licensed today and those that have been proposed to be built in the future.

For currently existing impoundments, Section 3.0 presents the following information:

- Data on the configuration of current impoundments.
- Results of compliance monitoring.

Section 3.0 also presents a description of the Method 115 radon monitoring method.

2.1.2 Current Understanding of Radon Risk

Section 4.0 presents a qualitative analysis of the changes that have occurred in the understanding of the risks associated with Rn-222 releases from impoundments. Emphasis is on the changes to the predicted radon progeny equilibrium fractions and the epidemiological and dosimetric lifetime fatal cancer risk per working level (WL). Section 4.0 also discusses how the current analytical computer model, CAP88 Version 3.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Finally, Section 4.4 presents dose and risk estimates for several current uranium recovery facilities.

2.1.3 Evaluation of Subpart W

The evaluation of Subpart W requirements required the analyses of some key issues to determine if the current technology has advanced since the 1989 promulgation of the rule. The key issues include: existing and proposed uranium recovery facilities, Resource Conservation and Recovery Act (RCRA) comparison, regulatory history, tailings impoundment technologies, radon measurement methods, and risk assessment. Section 5.0 discusses these key issues, in order to determine whether the requirements of Subpart W are necessary and sufficient.

Based on the evaluation of the key issues and in keeping with section 112(d) of the CAA, Section 5.0 also presents GACT radon emission control standards for three categories of uranium recovery facilities:

(1) Conventional impoundments.

(2) Nonconventional impoundments, where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids.

(3) Heap leach piles.

In addition to the key issues, several issues that need clarification in order to be more fully understood are presented and described. The issues in need of clarification include extending monitoring requirements, defining when the closure period for an operating facility begins, interpretation of the term “standby,” the role of weather events, and monitoring reporting requirements.

2.1.4 Economic Impact Analysis

Section 6.0 of the document reviews and reassesses all the additional economic impacts that may occur due to the extension and revision of the Subpart W NESHAP and specifically addresses the following:

- A review and summary of the original 1989 economic assessment and supporting documents are provided.

- The baseline economic costs for the development of new conventional mills and ISL and heap leach facilities are developed and presented.

- The anticipated costs to industries versus environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

- Finally, information is provided relating to economic impacts on disadvantaged populations and tribal populations and to environmental justice.

2.2 History of the Development of the Subpart W NESHAP

The following subsections present a brief history of the development of environmental radiation protection standards by EPA, with particular emphasis on the development of radionuclide NESHAPs.

Table 2 presents a partial time line sequence of EPA's radiation standards with emphasis on the NESHAPs, including Subpart W.

Table 2: Partial Timeline of EPA's Radiation Standards

January 13, 1977	EPA publishes 40 CFR 190 – Environmental Protection Standards for Nuclear Power Operations.
August 1979	EPA publishes first BID, *Radiological Impacts Caused by Emission of Radionuclides into Air in the United States*, EPA 520/7-79-006.
December 27, 1979	EPA determines radionuclides constitute a HAP – (section 112(a)(1) amendments to the CAA.
January 5, 1983	EPA under UMTRCA promulgates, 40 CFR 192, Subpart B "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites," that for inactive tailings or after closure of active tailings, the radon flux should not exceed an average release rate of 20 pCi/(m^2-sec).
March 1983	EPA publishes draft report, *Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-83-001, and proposes radionuclide NESHAPs for: 1. DOE and Non-NRC-Licensed Federal Facilities. 2. NRC-Licensed Facilities. 3. Elemental Phosphorus Plants. 4. Underground Uranium Mines.
September 30, 1983	EPA issues standards under UMTRCA (40 CFR 192, Subparts D and E) for the management of tailings at locations licensed by the NRC or the States under Title II of the UMTRCA. These standards do not specifically limit Rn-222 emissions until after closure of a facility; however, they require ALARA procedures for Rn-222 control.
February 17, 1984	SC sues EPA (District Court for Northern California) and demands EPA promulgate final NESHAP rules for radionuclides or find that they do not constitute a HAP (i.e., "de-list"" the pollutant). In August 1984, the court grants the SC motion and orders EPA to take final actions on radionuclides by October 23, 1984.
October 22, 1984	EPA issues *Final Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-84-022-1and -2.
October 23, 1984	EPA withdraws the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities.

Table 2: Partial Timeline of EPA's Radiation Standards

December 1984	District Court finds EPA in contempt. EPA and SC submit motion to court with schedule (August 5, 1985). Court orders EPA to issue final standards for Rn-222 emissions from licensed uranium mills and mill tailings impoundments by May 1, 1986 (later moved to August 15, 1986).
February 6, 1985, to September 24, 1986	EPA promulgates NESHAPs for: 1. DOE Facilities (February 1985). 2. NRC-Licensed Facilities and Non-DOE Federal Facilities (February 1985). 3. Elemental Phosphorus Plants (February 1985). 4. On April 17, 1985, Rn-222 emissions from underground uranium mines added. 5. On September 24, 1986, Rn-222 from licensed uranium mill tailings added – 20 pCi/(m^2-sec) and the work practice standard for small impoundments or continuous disposal.
November 1986	AMC and EDF file petitions challenging the NESHAPs for operating uranium mills.
July 28, 1987	The Court of Appeals for the District of Columbia remanded to EPA the NESHAP for vinyl chloride (see text). Given the decision, EPA petitioned the court for a voluntary remand of standards and asked that the pending litigation on all issues relating to its radionuclide NESHAPs be placed in abeyance during the rulemaking. EPA also agreed to reexamine all issues raised by parties to the litigation. The court granted EPA's petition on December 8, 1987.
September 14, 1989	EPA promulgates NESHAPs for benzene, etc. Importantly, EPA establishes the "fuzzy bright line." That is, EPA's approach to residual risk under section 112 (as advanced in the Hazardous Organic NESHAPs and approved by the District of Columbia Circuit in *NRDC v. EPA*) as essentially establishing a "fuzzy bright line" with respect to carcinogens, whereby EPA must eliminate risks above one hundred in one million (1 in 10,000) , does not have to address risks below one in one million (1 in 1,000,000), and has discretion to set a residual risk standard somewhere in between (Jackson 2009). In a second step, EPA can consider whether providing the public with "an ample margin of safety" requires risks to be reduced further than this "safe" level, based on EPA's consideration of health information and other factors such as cost, economic impact, and technological feasibility (Jackson 2009).
September 1989	EPA publishes the NESHAPs for radionuclides. The agency prepared an EIS in support of the rulemaking. The EIS consisted of three volumes: Volume I, *Risk Assessment Methodology*; Volume II, *Risk Assessments*; and Volume III, *Economic Assessment.*
December 15, 1989	EPA promulgates NESHAPs for: • Subpart B: National Emission Standards for Radon Emissions from Underground Uranium Mines. • Subpart H: Emissions of Radionuclides Other than Radon from DOE Facilities. • Subpart I: National Emissions of Radionuclides Other than Radon from DOE Facilities by NRC and Federal Facilities Not Covered by Subpart H. • Subpart K: Radionuclide Emissions from Elemental Phosphorus Plants. • Subpart Q: Radon Emissions from DOE Facilities. • Subpart R: Radon Emissions from Phosphogypsum Stacks. • Subpart T: Radon Emissions from the Disposal of Uranium Mill Tailings. (rescinded effective June 29, 1994; published in the FR July 15, 1994). • Subpart W: Radon Emissions from Operating Uranium Mill Tailings Piles.
November 15, 1990	President signs the CAA Amendments of 1990. Part of the act requires that some regulations passed before 1990 be reviewed and, if appropriate, revised within 10 years of the date of enactment of the CAA Amendments of 1990. The amendments also instituted a technology-based framework for HAPs. Sources that are defined as large emitters are to employ MACT, while sources that emit lesser quantities may be controlled using GACT.

2.2.1 The 1977 Amendments to the Clean Air Act

On January 13, 1977 (FR 1977), EPA established environmental protection standards for nuclear power operations pursuant to its authority under the Atomic Energy Act (AEA). The standards in 40 CFR 190, which covered all licensed facilities that are part of the uranium fuel cycle, established an annual limit on exposure to members of the public. The NRC or its Agreement States, which licenses these facilities, has the responsibility for the enforcement of the Part 190 standards. Additionally, the NRC imposes the requirement that licensees keep all exposures "as low as reasonably achievable" (ALARA). The Part 190 standards exempted Rn-222 from the annual limit because of the uncertainties associated with the risk of inhaled radon.

After the promulgation of 40 CFR 190, the 1977 amendments to the CAA were passed. These amendments included the requirement that the Administrator of EPA determine whether radionuclides should be regulated under the CAA.

In December 1979, the Agency published its determination in the *Federal Register* (FR 1979) that radionuclides constitute a HAP within the meaning of section 112(a)(1). As stated in the FR, radionuclides are known to cause cancer and genetic defects and to contribute to air pollution that may be anticipated to result in an increase in mortalities or an increase in serious, irreversible, or incapacitating reversible illnesses. The Agency further determined that the risks posed by emissions of radionuclides into the ambient air warranted regulation and listed radionuclides as a HAP under section 112.

Section 112(b)(1)(B) of the CAA requires the Administrator to establish NESHAPs at a "level which (in the judgment of the Administrator) provides an ample margin of safety to protect the public health" or find that they are not hazardous and delist them.

2.2.2 Regulatory Activities between 1979 and 1987

To support the development of radionuclide NESHAPs, the Agency developed a BID to characterize "source categories" of facilities that emit radionuclides into ambient air (EPA 1979). For each source category, EPA developed information needed to characterize the exposure of the public. This included characterization of the facilities in the source category (numbers, locations, proximity of nearby individuals); radiological source terms (curies/year (Ci/yr)) by radionuclide, solubility class, and particle size; release point data (stack height, volumetric flow, area size); and effluent controls (type, efficiency). Doses to nearby individuals and regional populations caused by releases from either actual or model facilities were estimated using computer codes (see Section 2.3).

In 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID (EPA 1983). These four source categories were the Department of Energy (DOE) and non-NRC-licensed federal facilities, NRC-licensed facilities, elemental phosphorus plants, and underground uranium mines. For all other source categories considered in the BID (i.e., coal-fired boilers, the phosphate industry and other extraction industries, uranium fuel-cycle facilities, uranium mill tailings, high-level waste disposal, and low-energy accelerators), the Agency found that NESHAPs were not necessary. In reaching this conclusion, the Agency found that either the levels of radionuclide emissions did not cause a significant dose to nearby

individuals or the regional populations, the additional effluent controls were not cost effective, or the existing regulations under other authorities were sufficient to keep emissions at an acceptable level.

During the public comment period on the proposed NESHAPs, the Agency completed its rulemaking efforts under the Uranium Mill Tailings Remedial Control Act (UMTRCA) to establish standards (40 CFR 192) for the disposal of uranium mill tailings. With respect to the emission of Rn-222, the UMTRCA standards established a design standard calling for an Rn-222 flux rate of no more than 20 pCi/(m^2-sec).

In February 1984, the SC sued EPA in the U.S. District Court for Northern California (*Sierra Club v. Ruckelshaus*, No. 84-0656) (EPA 1989), demanding that the Agency promulgate final NESHAPs or delist radionuclides as a HAP. The court sided with the plaintiffs and ordered EPA to promulgate final regulations. In October 1984, EPA withdrew the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities, finding that existing control practices protected the public health with an ample margin of safety (FR 1984). EPA also withdrew the NESHAP for underground uranium mines, but stated its intention to promulgate a different standard and published an Advance Notice of Proposed Rulemaking (ANPR) to solicit additional information on control methods. It also published an ANPR for licensed uranium mills. Finally, the FR notice affirmed the decision not to regulate the other source categories identified in the proposed rule, with the exception that EPA was doing further studies of phosphogypsum stacks to see if a standard was needed.

In December 1984, the U.S. District Court for Northern California found EPA's action of withdrawing the NESHAPs to be in contempt of the court's order. Given the ruling, the Agency issued the final BID (EPA 1984) and promulgated final standards for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities in February 1985 (FR 1985a), and a work practice standard for underground uranium mines in April of the same year (FR 1985b).

The EDF, the NRDC, and the SC filed court petitions seeking review of the October 1984 final decision not to regulate the source categories identified above, the February 1985 NESHAPs, and the April 1985 NESHAP. The AMC also filed a petition seeking judicial review of the NESHAP for underground uranium mines.

On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings (FR September 24, 1986), which established an emission standard of 20 pCi/(m^2-sec) for Rn-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. One justifications for the work practices was that, while large impoundments did not pose an unacceptable risk during active operations, the cyclical nature of the uranium milling industry could lead to prolonged periods of plant standby and the risk that the tailings impoundments could experience significant drying, with a resulting increase in Rn-222 emissions. Furthermore, the Agency believed that the two acceptable work practices actually saved the industry from the significant costs of constructing and closing large impoundments before they were completely filled. With the promulgation of the NESHAP for operating uranium mill tailings, three EPA regulations covered the releases of radionuclides into

the air during operations and tailings disposal at uranium mills: 40 CFR 190; 40 CFR 192; and 40 CFR 61, Subpart W.

In November 1986, the AMC and the EDF filed petitions challenging the NESHAP for operating uranium mill tailings.

2.2.3 Regulatory Activities between 1987 and 1989

While the petitions filed by the EDF, NRDC, SC, and AMC were still before the courts, the U.S. District Court for the District of Columbia, in *NRDC v. EPA* (FR 1989b), found that the Administrator had impermissibly considered costs and technological feasibility in promulgating the NESHAP for vinyl chloride. The court outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk and then considering additional factors, such as costs, to establish the "ample margin of safety." Given the court's decision, the Agency reviewed how it had conducted all of its NESHAP rulemakings and requested that the court grant it a voluntary remand for its radionuclide NESHAPs. As part of an agreement with the court and the NRDC, the Agency agreed to reconsider all issues that were currently being litigated, and it agreed that it would explicitly consider the need for a NESHAP for two additional source categories: radon from phosphogypsum stacks and radon from DOE facilities. The subsequent reconsideration became known as the radionuclide NESHAPs reconsideration rulemaking.

2.2.4 1989 Radionuclide NESHAPs Reconsideration Rulemaking

In the radionuclide NESHAPs reconsideration rulemaking, the Administrator relied on a "bright line" approach for determining whether a source category required a NESHAP. This meant that no NESHAP was required if all individuals exposed to the radionuclide emissions from the facilities in the source category were at a lifetime cancer risk of less than 1 in 1,000,000, and less than 1 fatal cancer per year was estimated to be incurred in the population. For source categories that did not meet this "bright line" exclusion, the Agency adopted a two-step, multi-factor approach to setting the emission standards.

The first step established a presumptively acceptable emissions level corresponding to an MIR of about 1 in 10,000 lifetime cancer risk, with the vast majority of exposed individuals at a lifetime risk lower than 1 in 1,000,000, and with less than 1 total fatal cancer per year in the exposed population. If the baseline emissions from a source category met these criteria, they were presumed adequately safe. If they did not meet these criteria, then the Administrator was compelled by his nondiscretionary duty to determine an emission limit that would correspond to risks that were adequately safe.

After baseline emissions were determined to be adequately safe or an adequately safe alternative limit defined, the analysis moved to the second step, where reduced risks for alternative emission limits were evaluated, along with the technological feasibility and costs estimated to be associated with reaching lower levels. In the two-step approach, the Administrator retained the discretion to decide whether the NESHAP should be set at these lower limits.

2.2.5 1990 Amendments to the Clean Air Act

NESHAP Subpart W is under consideration for revision because section 112(q)(1) requires that certain emission standards in effect before the date of enactment of the 1990 CAA Amendments shall be reviewed and, if appropriate, revised to comply with the requirements of section 112(d). As stated previously, soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically, negating the need to perform the Subpart W review. However, as discussed in Section 3.1, recent developments in the market for uranium have led to forecasts of growth in the uranium market over the next decade and continuing for the foreseeable future. Therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations at this time, before facilities developed in response to those forecasts become operational.

Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. Section 112(c) lists radionuclides, including radon, as an HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for the regulation of emissions of HAPs.

The regulation of HAPs at major sources is dictated by the use of maximum achievable control technology (MACT). Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating an MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

EPA has determined that radon emissions from uranium recovery facility tailings impoundments are an area source and that GACT applies (see Section 5.3). The Senate report on the legislation (U.S. Senate 1989) contains additional information on GACT and describes GACT as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.*

Determining what constitutes a GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. It is also necessary to consider the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are considered to determine whether such technologies and practices could be generally available for the area source category at issue. Finally, as noted above, in determining GACTs for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

2.3 Basis for the Subpart W 1989 Risk Assessment and Results

In the 1989 NESHAP for operating uranium mill tailings, exposures and risks were estimated using a combination of actual site data for existing impoundments and model or representative facilities for future impoundments and computer models. The 1989 risk assessment reflected the estimated risks to the regional (0-80 km [0-50 mile]) populations associated with the 11 conventional mills that were operating or in standby[2] at that time. Mathematical models were developed to simulate the transport of radon released from the mill tailings impoundments and the exposures and risks to individuals and populations living near the mills. Those models were programmed into three computer programs for the 1989 risk assessment: AIRDOS-EPA, RADRISK, and DARTAB. The paragraphs that follow briefly discuss each of these computer programs.

AIRDOS-EPA was used to calculate radionuclide concentrations in the air, rates of deposition on the ground, concentrations on the ground, and the amounts of radionuclides taken into the body via the inhalation of air and ingestion of meat, milk, and vegetables. A Gaussian plume model was used to predict the atmospheric dispersion of radionuclides released from multiple stacks or area sources. The amounts of radionuclides that are inhaled were calculated from the predicted air concentrations and a user-specified breathing rate. The amounts of radionuclides in the meat, milk, and vegetables that people ingest were calculated by coupling the atmospheric transport models with models that predict the concentration in the terrestrial food chain.

RADRISK computed dose rates to organs resulting from a given quantity of radionuclide that is ingested or inhaled. Those dose rates were then used to calculate the risk of fatal cancers in an exposed cohort of 100,000 persons. All persons in the cohort were assumed to be born at the same time and to be at risk of dying from competing causes (including natural background radiation). RADRISK tabulated estimates of potential health risk due to exposure to a known quantity of approximately 500 different radionuclides and stored these estimates until needed. These risks were summarized in terms of the probability of premature death for a member of the cohort due to a given quantity of each radionuclide that is ingested or inhaled.

DARTAB provided estimates of the impact of radionuclide emissions from a specific facility by combining the information on the amounts of radionuclides that were ingested or inhaled (as provided by AIRDOS-EPA) with dosimetric and health effects data for a given quantity of each radionuclide (as provided by RADRISK). The DARTAB code calculated dose and risk for individuals at user-selected locations and for the population within an 80-km radius of the source. Radiation doses and risks could be broken down by radionuclide, exposure pathway, and organ.

Of the 11 conventional mills that were operating or in standby at that time, seven had unlined impoundments (the impoundments were clay lined, but not equipped with synthetic liners), while five had impoundments with synthetic liners. As the NESHAP revoked the exemption to the liner requirement of 40 CFR 192.32(a), the mills with unlined impoundments had to close the

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[2] "Standby" means the period of time when a facility may not be accepting new tailings but has not yet entered closure operations.

impoundments and move towards final reclamation and long-term stabilization of the tailings impoundments.

2.3.1 Existing Impoundments

The NESHAP for operating uranium mill tailings addressed both existing and future tailings impoundments. For the existing impoundments, the radon emissions and estimated risks were developed using site-specific data for each of the 11 mills that were operating or in standby at the time the assessment was made. These data included the average Ra-226 content of the tailings, the overall dimensions and areas of the impoundments (developed from licensing data and aerial photographs), areas of dry (unsaturated) tailings, the existing populations within 5 km of the centers of the impoundments (identified by field enumeration), 5–80 km populations derived from U.S. Census tract data, meteorological data (joint frequency distributions) from nearby weather stations, mixing heights, and annual precipitation rates.

The AIRDOS-EPA code was used to estimate airborne concentrations based on the calculated Rn-222 source term for each facility. Rn-222 source terms were estimated on the assumption that an Rn-222 flux of 1 pCi/(m^2-sec) results for each 1 picocurie per gram (pCi/g) of Ra-226 in the tailings and the areas of dried tailings at each site. The radon flux rate of 1 pCi/(m^2-sec) per pCi/g Ra-226 was derived based on theoretical radon diffusion equations and on the lack of available radon emissions measurements.

For each sector in the 0–80 km grid around each facility, the estimated Rn-222 airborne concentration was converted to cumulative working level months (WLMs), assuming a 0.50 equilibrium fraction between radon and its decay products, an average respiration rate appropriate for members of the general public, and the assumption of continuous exposure over a 70-year lifetime. Using a risk coefficient of 760 fatalities/10^6 WLM, lifetime risk, fatal cancers per year, and the risk distribution were calculated for the exposed population.

The baseline risk assessment for existing uranium tailings showed an MIR of 3×10^{-5} which was below the benchmark level of approximately 1×10^{-4} and is, therefore, presumptively safe. Additionally, the risk assessment calculated 0.0043 annual fatal cancers in the 2 million persons living within 80 km of the mills. The distribution of the cancer risk showed that 240 persons were at risks between 1×10^{-5} and 1×10^{-4}, and 60,000 were at risks between 1×10^{-6} and 1×10^{-5}. The remainder of the population of about 2 million was at a risk of less than 1×10^{-6}. Based on these findings, EPA concluded that baseline risks were acceptable.

The decision on an ample margin of safety considered all of the risk data presented above plus costs, scientific uncertainty, and the technical feasibility of control technology necessary to lower emissions from operating uranium mill tailings piles. As the risks from existing emissions were very low, EPA determined that an emission standard of 20 pCi/(m^2-sec), which represented current emissions, was all that was necessary to provide an ample margin of safety. The necessity for the standard was explained by the need to ensure that mills continued the current control practice of keeping tailings wet and/or covered. Finally, to ensure that ground water was not adversely affected by continued operation of existing piles that were not synthetically lined

or clay lined, the NESHAP ended the exemption to the requirements of 40 CFR 192.32(a), which protects water supplies from contamination.

2.3.2 New Impoundments

The 1989 risk assessment for new mill tailings impoundments was based on a set of model mills, defined so that the impact of alternative disposal strategies could be evaluated. For the purpose of estimating the risks, the model mills were characterized to reflect operating mills, and the dispersion modeling and population exposures were based on the arid conditions and sparse population density that characterize existing impoundments in the southwestern states.

For new impoundments, a baseline consisting of one large impoundment (116 acres, which is 80% wet or ponded during its 15-year active life) was modeled (i.e., the continuation of the current practice). The baseline results indicated an MIR of 1.6×10^{-4}, a fatal cancer incidence of 0.014 per year, and only 20 persons at a risk greater than 1×10^{-4}. Given the numerous uncertainties in establishing the parameters for the risk assessment and in modeling actual emissions and exposures, the Administrator found that the baseline emissions for new tailings impoundments met the criteria for presumptively safe.

The decision on an ample margin of safety for new tailings considered two alternatives to the baseline of one large impoundment: phased disposal using a series of small impoundments and continuous disposal. The evaluation of these alternatives showed a modest reduction in the MIR and the number of fatal cancers per year, but a significant increase in the number of individuals at a lifetime risk of less than 1×10^{-6}. The costs estimated for the two alternatives showed that phased disposal would lead to an incremental cost of $6.3 million, while continuous disposal was believed to actually result in a modest cost saving of $1 million.

Given the large uncertainties associated with the risk and economic assessments performed for the new tailings impoundments, and considering the boom and bust cycles that the uranium industry has experienced, EPA determined that a work practice standard was necessary to prevent the risks from increasing if an impoundment were allowed to become dry. Finally, although continuous disposal showed slightly lower overall risks and costs than phased disposal, the Administrator recognized that it was not a proven technology for disposal of uranium mills tailings. Therefore, he determined that the work practice standard should allow for either phased disposal (limited to 40-acre impoundments, with a maximum of two impoundments open at any one time) or continuous disposal.

3.0 THE URANIUM EXTRACTION INDUSTRY TODAY: A SUMMARY OF THE EXISTING AND PLANNED URANIUM RECOVERY PROJECTS

Section 3.1 describes the historical uranium market in the United States. In the 1950s and 1960s, the market was dominated by the U.S. government’s need for uranium, after which the commercial nuclear power industry began to control the market. The next three sections describe the types of process facilities that were and continue to be used to recover uranium. Section 3.2 describes conventional mills and includes descriptions of several existing mines, while Section 3.3 describes ISL facilities. Heap leach facilities are described in Section 3.4. Finally,

Section 3.5 discusses the applicability of the Subpart W recommended radon flux monitoring method.

3.1 The Uranium Market

The uranium recovery industry in the United States is primarily located in the arid southwest. From 1960 to the mid 1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. The majority of the uranium production at that time was associated with defense needs, while a lesser amount was associated with commercial power reactor needs. Without exception, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. The conventional uranium mining/milling process is described in Section 3.2.

When the demand for uranium could not support the existing number of uranium recovery operations, there was a movement to decommission and reclaim much of the uranium recovery industry in the United States.

The UMTRCA Title I program established a joint federal/state-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet standards set by EPA.

The UMTRCA Title II program is directed toward uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the act provides –

- NRC authority to control radiological and nonradiological hazards.
- EPA authority to set generally applicable standards for both radiological and nonradiological hazards.
- Eventual state or federal ownership of the disposal sites, under general license from NRC.[3]

In the mid- to late 1980s, several commercial uranium recovery projects employing the solution, or ISL, mining process came on line. Section 3.3 describes the uranium ISL mining process. The uranium ISL projects and the data that they collected served as the industry standard. This industry saw an increase in activity as the conventional mine/milling operations were being shut down.

This shift in the method of uranium mining was associated with economic conditions that existed at the time. The price of uranium rapidly declined in the 1980s. The decline in price was associated with overproduction that took place during the earlier years. The peak in production was associated with Cold War production and associated contracts with DOE. However, as the

[3] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/mill-tailings.html

Cold War came to an end, the need for uranium began to diminish. The amount of uranium that was needed for DOE projects was greatly diminished and, therefore, the price of uranium saw a decline. Figure 1 shows the spot prices for natural uranium. Note the price decline in the early 1980s.

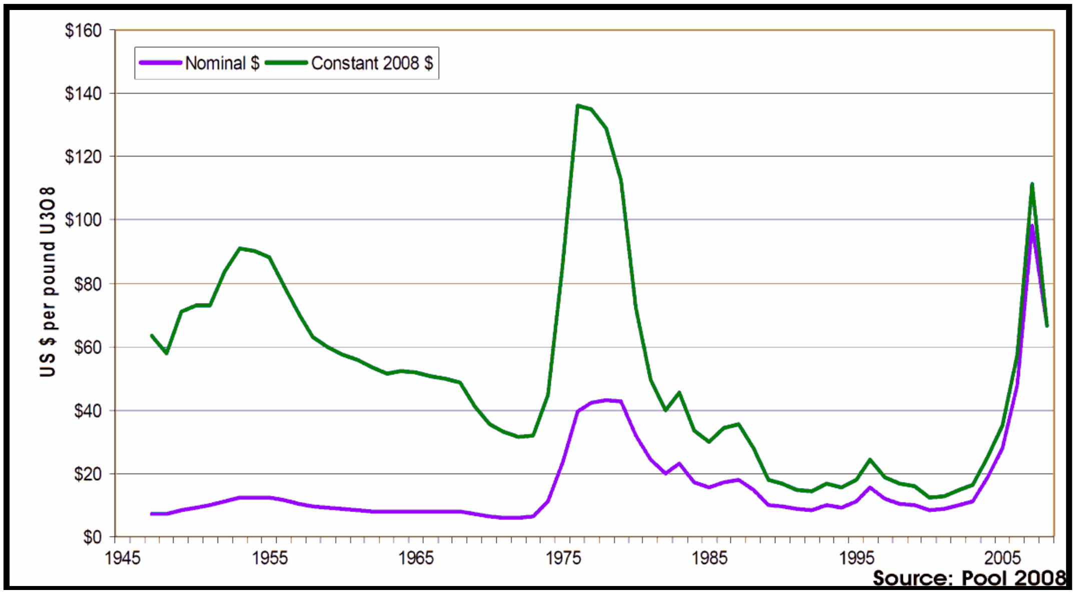
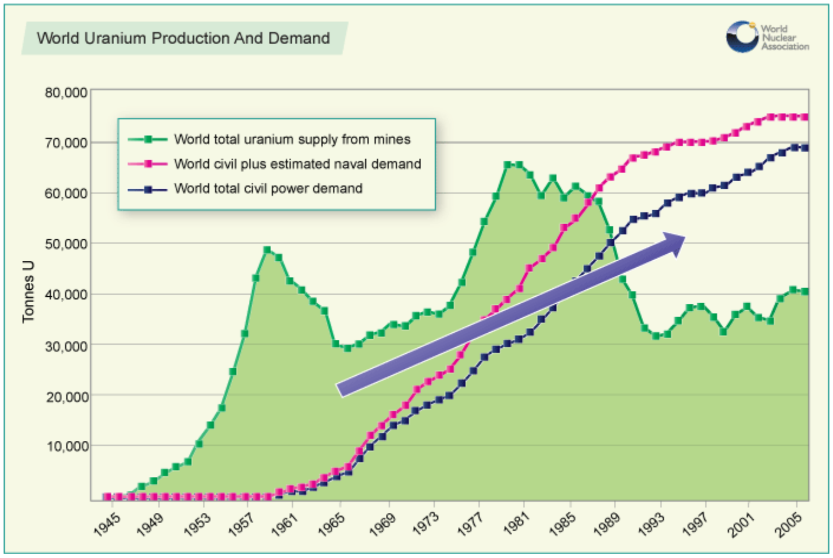


Figure 1: Historical Uranium Prices

Additionally, inexpensive uranium appeared on the worldwide market associated with the foreign supplies of low-grade and rather impure yellowcake. Only minimal purification and associated refinement was necessary to produce a yellowcake feedstock that could supply domestic and worldwide uranium needs from the low-grade foreign supply. Finally, the megatons to megawatts downblending program also supplied large supplies of uranium, both domestically and worldwide. Classical supply and demand economic principles established a market that had oversupply, constant demand and, therefore, a declining price. Consequently, the uranium industry in the United States saw a production decline. Although the number of uranium operations and production of domestic supply of uranium declined, several domestic uranium projects remained active, primarily supplying foreign uranium needs. These projects were generally located in the ISL mining production states of Nebraska, Texas, and Wyoming. This represented a significant shift in the method that was used to recover uranium, from conventional mines to ISL mines.

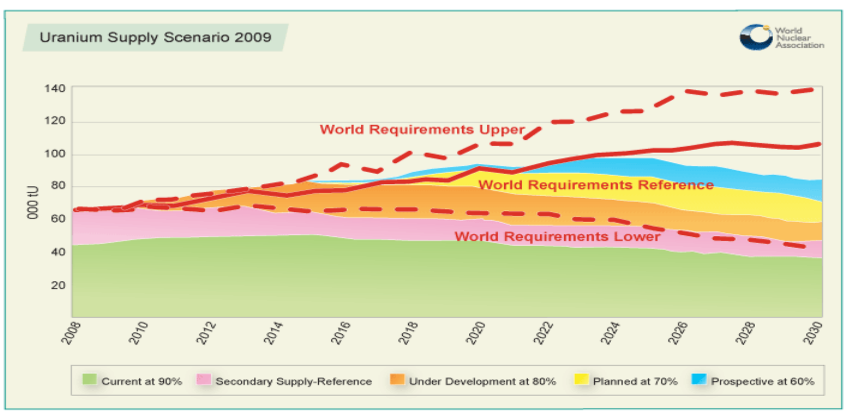
Numerous forecasts of worldwide uranium supply and demand exist. Perhaps one of the best graphical representations is from the World Nuclear Association. Figure 2 shows the actual uranium production rates from 1945 to 2005, as well as the demand trend that was established based on these production numbers. Figure 2 indicates that, from the 1960s to the present, the worldwide uranium demand has continued to increase even though the U.S. price for uranium has decreased.



Source: WNA 2010

Figure 2: Uranium Production and Demand from 1945 to 2005

Figure 3 shows the uranium supply scenario forecast by the World Nuclear Association. The three potential requirement curves shown are based on a variety of factors. The figure indicates that current production, as well as planned future worldwide production, may begin to fall short of demand in the next few years.



Source: WNA 2010

Figure 3: Uranium Supply Scenario from 2008 to 2030

In summary, all forecasts are for the uranium industry to show growth in the next decade and continuing for the foreseeable future. Drivers for this trend are a worldwide need for clean energy resources, the current trend to develop domestic sources of energy, and the investment of foreign capital in the United States, which is recognized as a politically and economically stable market in which to conduct business.

3.2 Conventional Uranium Mining and Milling Operations

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. There are currently no licensed heap leach facilities. Conventional uranium mining and milling operations are in the minority and are a carryover from the heavy production days of the 1970s and 1980s. Sweetwater Mill, Shootaring Canyon Mill, and White Mesa Mill represent the extent of the current conventional uranium milling operations that exist in the United States.

A conventional uranium mill is generally defined as a chemical plant that extracts uranium using the following process:

(1) Trucks deliver uranium ore to the mill, where it is crushed into smaller particles before the uranium is extracted (or leached). In most cases, sulfuric acid (H_2SO_4) is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. In addition to extracting 90–95% of the uranium from the ore, the leaching agent also extracts several other "heavy metal" constituents, including molybdenum, vanadium, selenium, iron, lead, and arsenic.

(2) The mill then concentrates the extracted uranium to produce a material called "yellowcake" because of its yellowish color.

(3) Finally, the yellowcake is transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 4 shows a schematic of a typical conventional uranium mill.

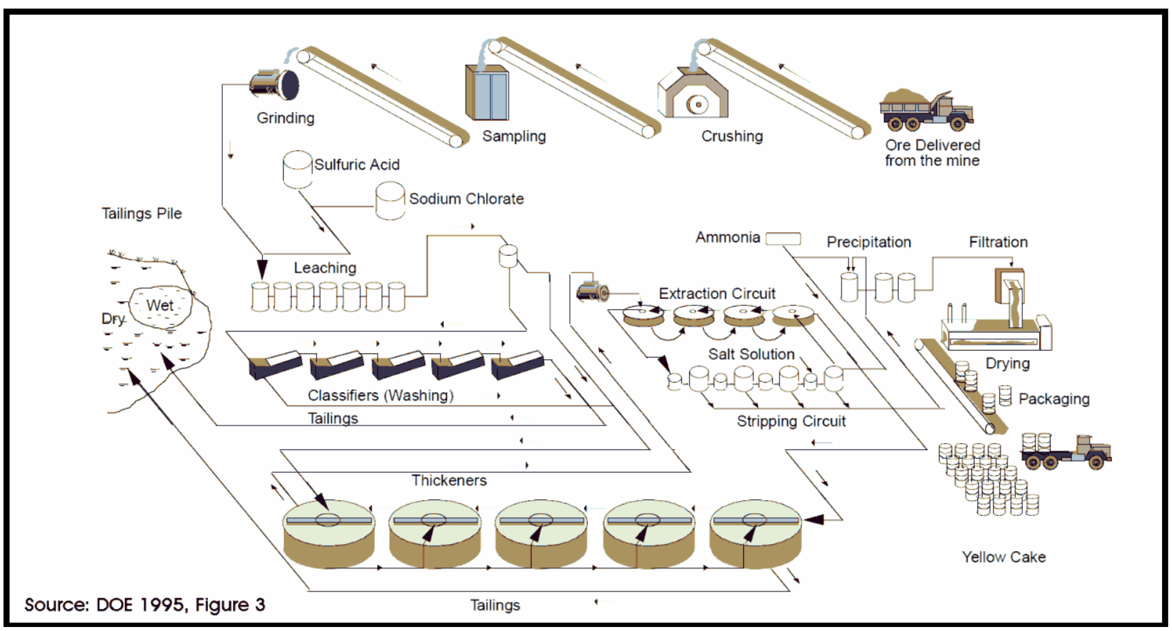


Figure 4: Typical Conventional Uranium Mill

Currently, there are three domestic licensed conventional uranium mining and milling facilities and a newly licensed facility that has yet to be constructed, as shown in Table 3.

Table 3: Conventional Uranium Mining and Milling Operations

Mill Name	Licensee	Location	Website
Sweetwater	Kennecott Uranium Co/Wyoming Coal Resource Co	Sweetwater County, Wyoming	None identified
Shootaring Canyon	Uranium One Americas	Garfield County, Utah	http://www.uranium1.com/ indexu.php?section=home
White Mesa	EFR White Mesa LLC	San Juan County, Utah	http://www.energyfuels.com/ white_mesa_mill/
Piñon Ridge	Energy Fuels Resources Corp.	Montrose County, Colorado	http://www.energyfuels.com/ projects/pinon-ridge/index.html
Mill Name	**Regulatory Status**		**Capacity (tons/day)**
Sweetwater	Standby,* license expires November 2014		3,000
Shootaring Canyon	Standby,* license expires May 2012		750
White Mesa	Operating, license expires March 2015		2,000
Piñon Ridge	Development, license issued January 2011		500 (design)

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

Instead of processing uranium ore, the conventional mills shown in Table 3 may process alternate feed stocks. These feed stocks are generally not typical ore, but rather materials that contain recoverable amounts of radionuclides, rare earths, and other strategic metals. These feed stocks are processed, the target materials are recovered, and the waste tailings are discharged to the tailings impoundment. The two facilities shown in Table 3 as being in standby (Sweetwater and Shootaring Canyon) have had their operating licenses converted into "possession only" licenses. Prior to recommencing operation, those facilities will be required to submit a license application to convert back to an operating license. EPA will review that portion of the license application associated with NESHAP to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures.

As described in Section 3.1, the rapid rise in energy costs, increased concerns about global warming, and the tremendous worldwide surge in energy use have all led to renewed interest in uranium as an energy resource. At the spring 2010 joint National Mining Association (NMA)/ NRC Uranium Recovery Workshop, the NRC identified numerous projects that have filed or are expected to file applications for new licenses, expansions of existing operations, or restarts of existing operations, including several proposals for conventional uranium recovery facilities. Contacts with the NRC and state regulatory agencies indicate that permitting and licensing actions are associated with the proposed conventional uranium milling and processing projects shown in Table 4. Although a significant uranium producer, at present, Texas has no interest in conventional uranium milling operations. The potential new mill at Piñon Ridge, Colorado, is not shown in Table 4, since its development is advanced and it has already been listed in Table 3.

Table 4: Proposed New Conventional Uranium Milling Facilities

Company	Site	(Estimated) Application Date	State
Uranium Energy Corp	Anderson Project	N.A.	AZ
Rio Grande Resources	Mt. Taylor	FY14	NM
Strathmore Minerals Corporation	Roca Honda	12-Sep	NM
Uranium Resources, Inc.	Juan Tafoya	FY 14	NM
Oregon Energy, LLC	Aurora Uranium Project	13-Dec	OR
Virginia Uranium	Coles Hills	N.A.	VA
Strathmore Minerals Corporation	Gas Hills	12-Sep	WY

N.A. = not available

No new construction has taken place on any milling facilities shown in Table 4; however, as with all industries, planning precedes construction. Considerable planning is underway for existing and new uranium recovery operations. As with facilities currently in standby, EPA will review the license application to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures for these proposed new mills.

No specific information is available on the type of tailings management systems intended for the proposed new conventional mills. To limit radon that could be emitted from the tailings impoundments, Subpart W requires that the tailings be disposed of in a phased disposal system with disposal cells not larger than 40 acres, or by continuous disposal in which not more than 10 acres of exposed tailings may accumulate at any time. Regardless of the type of tailings management system the new milling operations select, they will all also have to demonstrate that their proposed tailings impoundment systems meet the requirements in 40 CFR 192.32(a)(1).

3.2.1 Sweetwater Mill, Kennecott Mining Company, Red Desert, Wyoming

The Sweetwater project is a conventional uranium recovery facility located about 42 mi northwest of Rawlins, Wyoming, in Sweetwater County. The site is very remote and located in the middle of the Red Desert. The approximately 1,432-acre site includes an ore pad, overburden pile, and the milling area (see Figure 5). The milling area consists of administrative buildings, the uranium mill building, a solvent extraction facility, and a maintenance shop. There is also a 60-acre tailings management area with a 37-acre tailings impoundment that contains approximately 2.5 million tons of tailings material. The Sweetwater impoundments are synthetically lined, as required in 40 CFR 192.32(a). The facility is in a standby status and has a possession only license administered by the NRC. The future plans associated with this facility are unknown, but the facility has been well maintained and is capable of processing uranium. The standby license for this facility is scheduled to expire in 2014. The licensee and/or regulator will decide whether to renew or to terminate this license.

Figure 5: Sweetwater – Aerial View

To demonstrate compliance with Subpart W, testing on the facility's tailings impoundment for radon emissions is conducted annually (KUC 2011). Table 5 shows the results of that testing. The lower flux readings measured in 2009 and 2010 are a direct result of the remediation work (regrading and lagoon construction in the tailings impoundment) performed in 2007 and 2008.

Table 5: Sweetwater Mill Radon Flux Testing Results

Test Date	Radon Flux (pCi/(m^2-sec))	Test Date	Radon Flux (pCi/(m^2-sec))
August 7, 1990	9.0	August 14, 2001	6.98
August 13, 1999	5.1	August 13, 2002	4.10
August 5, 1992	5.6	August 12, 2003	7.11
August 24, 1993	5.0	August 17, 2004	6.38
August 23, 1994	5.0	August 16, 2005	7.63
August 15, 1995	3.59	August 15, 2006	3.37
August 13, 1996	5.47	August 13, 2007	6.01
August 26, 1997	4.23	August 5, 2008	4.59
August 11, 1998	2.66	July 30, 2009	1.60
August 10, 1999	1.27	August 10, 2010	1.44
August 8, 2000	4.05		

Source: KUC 2011, p. 6

Summary of Results

Air monitoring data were reviewed for a 26-year period (1981 to 2007). Upwind Rn-222 measurements, as well as downwind Rn-222 values, were available. The average upwind radon value for the period of record was 3.14 picocuries per liter (pCi/L). The average downwind radon value for the same period was 2.60 pCi/L. These values indicate that there is no measurable contribution to the radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility.

Approximately 28.3 acres of tailings are dry with an earthen cover; the remainder of the tailings is continuously covered with water. The earthen cover is maintained as needed. One hundred radon flux measurements were taken on the exposed tailings, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed beaches was 8.5 pCi/(m^2-sec). The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/(m^2-sec). The calculated radon flux from the entire tailings impoundment surface is approximately 30% of the 20.0 pCi/(m^2-sec) standard.

3.2.2 White Mesa Mill, Energy Fuels Corporation, Blanding, Utah

The White Mesa project is a conventional uranium recovery facility located about 6 mi south of Blanding, Utah, in San Juan County. The approximately 5,415-acre site includes an ore pad, overburden pile, and the milling area (see Figure 6). The mill area occupies approximately 50 acres and consists of administrative buildings, the uranium milling building, and ancillary facilities. The facility used a phased disposal impoundment system, and two of the 40-acre cells are open. The facility has operated intermittently in the past, and this type of operation continues on a limited basis. The amount of milling that takes place, as well as the amount of uranium that is being produced, is a small fraction of the milling capacity. The uranium recovery project has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control.

Figure 6: White Mesa – Aerial View

To demonstrate compliance with Subpart W, the radon flux from tailings surfaces is measured and reported to the State of Utah annually. As Table 6 shows, these data consistently demonstrate that the radon flux from the White Mesa Mill's tailings cells are below the criteria.

Table 6: White Mesa Mill's Annual Radon Flux Testing, Tailings Cells 2 & 3

Year	Radon Flux (pCi/(m^2-sec))	
	Cell 2	Cell 3
1997	12.1	16.8
1998	14.3	14.9
1999	13.3	12.2
2000	9.3	10.1
2001	19.4	10.7
2002	19.3	16.3
2003	14.9	13.6
2004	13.9	10.8
2005	7.1	6.2

Source: Denison 2007, p. 116

The Table 6 radon flux values for 2001 and 2002 were elevated when compared to the prior years. Denison believes that these radon fluxes were largely due to the drought conditions in those years, which reduced the moisture content in the interim cover placed over the inactive portions of tailings Cells 2 and 3. In addition, the beginning of the 2002 mill run, which resulted in increased activities on the tailings cells, may have contributed to these higher values. As a result of the higher radon fluxes during 2001 and 2002, additional interim cover was placed on

the inactive portions of Cells 2 and 3. While this effort was successful, additional cover was applied again in 2005 to further reduce the radon flux (Denison 2007).

Summary of Results

Air monitoring data were reviewed for a 2-year period (2006 to 2008). The White Mesa site utilized the MILDOS code to calculate radon concentrations (ANL 1998), in the same calculation process that had been used since 1995. As a comparison, Denison Mines reactivated the six air monitoring stations that were used at the site. Data from these stations were collected for a 2-year period. The upwind and downwind measurements showed no definable trends. At times, the upwind concentrations were the higher values, while at other times, the downwind concentrations were the greatest. However, all values were within regulatory standards.

The tailings facilities at the White Mesa facility consist of the following impoundments/cells (Denison 2011):

- Cell 1, constructed with a 30-millimeter (mil) PVC earthen-covered liner, is used for the evaporation of process solution (Cell 1 was previously referred to as Cell 1-I, but is now referred to as Cell 1).

- Cell 2, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands. Cell 2 has 67 acres of surface area. Because 99% of the cell has a soil cover over the deposited tailings, only 0.7 acres of tailings are exposed as tailings beaches.

- Cell 3, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands and solutions. Cell 3 has 71 acres of surface area, and 54% of the cell has a soil cover over the deposited tailings. The remainder of the cell consists of tailings beaches (19%) and standing liquid (26%).

- Cell 4A, constructed with a geosynthetic clay liner, a 60-mil high-density polyethylene (HDPE) liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in October 2008.

- Cell 4B, constructed with a geosynthetic clay liner, a 60-mil HDPE liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in February 2011.

One hundred radon flux measurements were collected on the Cell 2 beach area, and an additional 100 measurements were taken on the soil-covered area in accordance with Method 115 for Subpart W analysis. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The average radon flux for all of Cell 2 was calculated to be 13.5 pCi/(m^2-sec), or about 68% of the 20.0 pCi/(m^2-sec) standard.

At Cell 3, 100 radon flux measurements were collected from each of the soil cover and the beach areas, as required by Method 115. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The radon flux from the standing liquid-covered area was assumed to be zero. The average radon flux for all of Cell 3 was calculated to be 8.9 pCi/(m^2-sec), or about 46% of the 20.0 pCi/(m^2-sec) standard.

3.2.3 Shootaring Canyon Mill, Uranium One Incorporated, Garfield County, Utah

The Shootaring Canyon project is a conventional uranium recovery facility located about 3 mi north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings management system that is partially constructed (see Figure 7). The mill circuit operated for a very short time and generated only enough tailings to cover 7 acres of the impoundment. Although the milling circuit has been dismantled and sold, the facility is in a standby status and has a possession only license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company. The standby license for this facility is scheduled to expire in 2014. The licensee and/or the regulator will decide whether to renew or to terminate this license.

Figure 7: Shootaring Canyon – Aerial View

Summary of Results

Air monitoring data were reviewed for a 2-year period (2009 to 2010). Continuous air monitoring is not conducted at the site; rather, a 20- to 24-hour sampling event is required once per quarter as a condition of the license. The high-volume air sampler is located downwind of the tailings facility. Many sampling events during a 2-year period indicate that the downwind

Rn-222 concentrations are around 1% of the allowable effluent concentration limit. The two years of data reviewed indicated no trends.

The Shootaring Canyon facility operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in an area of 2,508 m^2 (0.62 acres). The tailings are dry except for moisture-associated occasional precipitation events; consequently, there are no beaches. The tailings have a soil cover that is maintained by the operating company. The impoundment at Shootaring Canyon is synthetically lined, as required in 40 CFR 192.32(a).

One hundred radon flux measurements were collected on the soil-covered tailings area in accordance with Method 115. The 2009 sampling results indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), which exceeded the allowable 20 pCi/(m^2-sec) regulatory limit. In response to this result, the licensee notified the Utah Division of Radiation Control and placed additional soil cover on the tailings. The soil cover consisted of local borrow materials in the amount of 650 cubic yards. More sampling took place during the week of November 7, 2009. An additional 100 sample results were collected and showed that the average radon flux was reduced to 18.1 pCi/(m^2-sec). Sampling for 2010 took place in April. Again, 100 radon flux measurements were collected. The average radon flux revealed by this sampling was 11.9 pCi/(m^2-sec).

3.2.4 Piñon Ridge Mill, Bedrock, Colorado

The Piñon Ridge project is a permitted conventional uranium recovery facility in development. The permitted location is located about 7 mi east of Bedrock, Colorado, and 12 mi west of Naturita, Colorado, in Montrose County (see Figure 8). The approximately 1,000-acre site will include an administration building, a 17-acre mill site, a tailings management area with impoundments totaling approximately 90 acres, a 40-acre evaporation pond with proposed expansion of an additional 40-acre evaporation pond as needed, a 6-acre ore storage area, and numerous access roads. The design of the tailings management area is such that it can meet the work practice standard with a synthetically lined impoundment, a leak detection system, and a surface area that does not exceed 40 acres. The facility has not been constructed, but is fully licensed and administered by the Colorado Department of Public Health and Environment. Also, EPA has approved the facility's license to construct under NESHAP Subpart A of 40 CFR 61. Current activities at the site are maintenance of pre-operational environmental monitoring.

Figure 8: Piñon Ridge – Aerial View

3.2.5 Conventional Mill Tailings Impoundments and Radon Flux Values

In summary, the radon data for the active mill tailings impoundments indicate that the radon exhalation rates from the measured surfaces have exceeded the regulatory standard of 20 pCi/(m^2-sec) at times. Two instances exist in the records that were reviewed. One instance was in 2007, when a portion of the Cotter Corporation impoundment did not have sufficient soil cover. Monitoring results showed a flux rate of 23.4 pCi/(m^2-sec). The tailings surface was covered with a soil mixture, and the flux rate was reduced to 14.0 pCi/(m^2-sec). The second instance in which the regulatory standard was exceeded was recorded during the 2009 sampling event at Shootaring Canyon Mill. This sampling event indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), caused by insufficient soil cover. Although covering tailings piles with various other materials (e.g., synthetics, asphalt, soil-cement mixtures) has been studied, covers made of earth or soil have been shown to be the most cost effective in reducing radon emissions (EPA 1989, NRC 2010). In both cases when monitoring indicated radon fluxes in excess of the standard, additional soil cover was added to the tailings, and the radon flux rates were reduced to below the regulatory standards.

Table 8 shows the average/calculated radon flux values, as reported by the uranium recovery operators.

Table 7: Mill Tailings Impoundments and Average/Calculated Radon Flux Values*

Facility	Radon Flux (pCi/(m^2-sec))		Calculated Tailings Impoundment Average Radon Flux (pCi/(m^2-sec))
	Soil-Covered Area	Tailings Beach	
Sweetwater Mill	No soil-covered area	8.5	6.01
White Mesa Mill, Cell 2	13.1	50.2	13.5
White Mesa Mill, Cell 3	13.9	6.7	8.9
Shootaring Canyon Mill	15 2-year average	Not applicable	15 2-year average
Piñon Ridge Mill	Not applicable	Not applicable	Not applicable

* The respective uranium recovery operators supplied all data and calculations.

3.3 In-Situ Leach Uranium Recovery (Solution Mining)

Solution, ISL or in-situ recovery (ISR), mining is defined as the leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface (IAEA 2005). Leaching, or more correctly the remobilization of uranium into solution, is accomplished through the injection into the ore body of a lixiviant. The injection of a lixiviant essentially reverses the geochemical reactions associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects of the 1980s demonstrated solution mining as a viable uranium recovery technique. Initial efforts at the solution mining process were often less than ideal:

- Lixiviant injection was difficult to control, primarily because of poor well installation.
- Laboratory-scale calculations did not always perform as suspected in geological formations.
- Recovery well spacing was poorly understood, causing mobilized solutions to migrate in unsuspected pathways.
- Restoration efforts were not always effective in re-establishing reducing conditions; therefore, some metals remained in solution and pre-mining ground water conditions were not always achievable.

Additional research and development work indicated that mining solutions could be controlled with careful well installation. The use of reducing agents during restoration greatly decreased the amount of metals that were in solution. As a result of these modifications in mining methods, solution mining of uranium became a viable method to recover some uranium deposits, many of which could not be economically mined by the open pit methods typically employed by the uranium industry. Additionally, the economics of solution mining were more favorable than conventional mining and milling. Because of these factors, solution mining and associated processing began to dominate the uranium recovery industry. Figure 10 shows a schematic of a typical ISL uranium recovery facility.

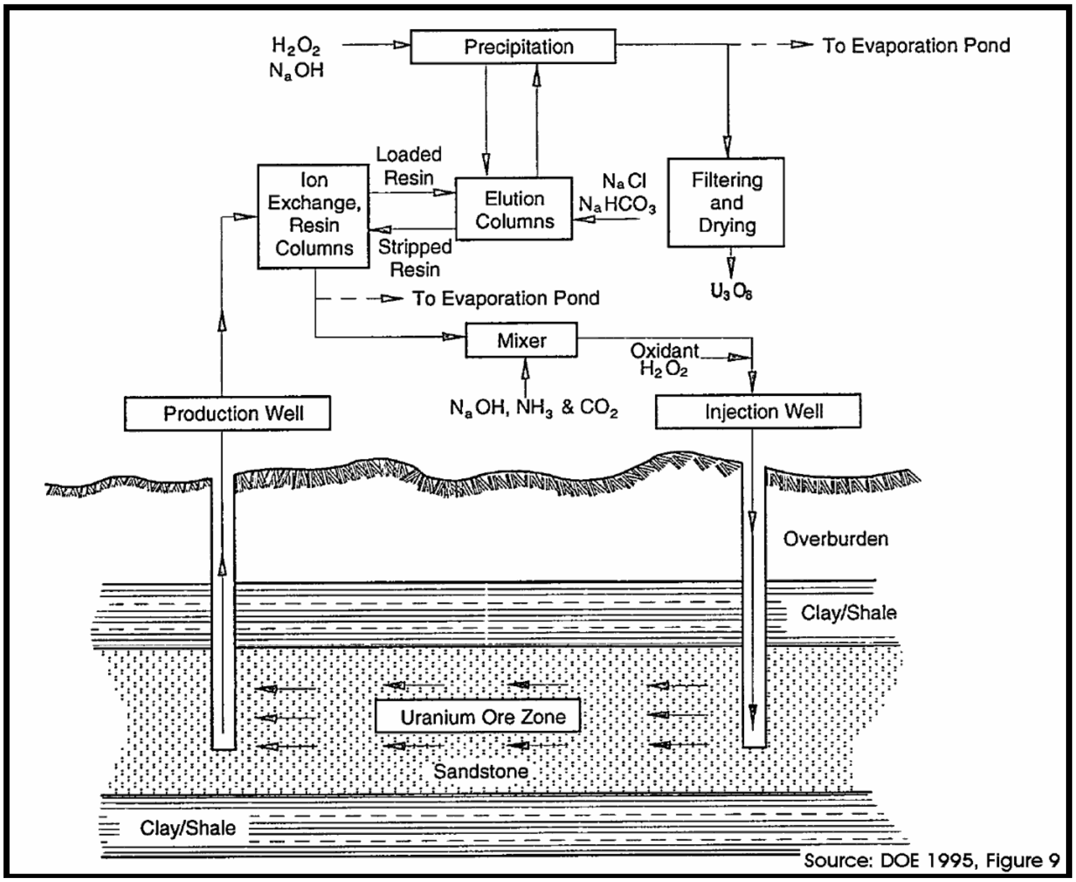


Figure 9: In-Situ Leach Uranium Recovery Flow Diagram

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. As Figure 10 shows, the liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. The pond/impoundment may be used to dispose of the liquid via evaporation, or it may be used simply to hold the liquid until a sufficient amount has been accumulated so that other means may be used to dispose of it (e.g., land application or irrigation, deep well disposal). Since Ra-226 is present in the water bled from the lixiviant, radon will be generated in and released from the solution mining facility's evaporation/holding ponds or impoundments.

The 1989 NESHAP risk assessment (EPA 1989), although not conducted specifically for solution mining sites, is applicable to ponds/impoundments at solution mining facilities. All of the ponds at solution mining facilities are synthetically lined. Because of the presence of liners, none would be required to be closed. The solution mining industry is more transient in that the impoundment life is less than those at conventional uranium mining and milling sites. Typically, the impoundments are in the range of 1–4 acres and are built to state-of-the-art standards.

Two types of lixiviant solutions, loosely defined as acid or alkaline systems, can be used. In the United States, the geology and geochemistry of most uranium ore bodies favor the use of "alkaline" lixiviants or bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of

the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground water restoration. The acid systems once used in the United States are still used in Eastern Europe and Asia and were used recently in Australia on ore bodies in saline aquifers (IAEA 2005).

The four major types of uranium deposits in the United States are: strata-bound (roll front), solution breccia pipe, vein, and phosphatic deposits (EPA 1995). Of these, ISL is the uranium recovery technique used mostly on strata-bound ore deposits. Strata-bound ore deposits are ore deposits contained within a single layer of sedimentary rock. They account for more than 90% of the recoverable uranium and vanadium in the United States and are found in three major geographic areas: the Wyoming Basin (Wyoming and Nebraska), Colorado Plateau or Four Corners area (northwestern New Mexico, western Colorado, eastern Utah, and northeastern Arizona), and southern Texas. A discussion of the origin of the uranium ore, including ore body formation and geochemistry, may be found in the reference, *Technical Resource Document Extraction and Beneficiation of Ores and Minerals*, Volume 5, "Uranium" (EPA 1995). Much of the recoverable uranium in these regions lends itself to ISL because of the physical and geochemical properties of the ore bodies.

Four times a year, the Energy Information Administration (EIA) publishes data on the status of U.S. ISL facilities. EIA (2013) identified six ISL facilities that were recovering uranium and producing yellowcake in the 2nd quarter of 2013. Table 8 shows these facilities. These operations are located in NRC-regulated areas, as well as in Agreement States.

Table 8: Operating ISL Facilities

Plant Owner	Plant Name	County, State
Cameco	Crow Butte Operation	Dawes, Nebraska
Power Resources, Inc. dba Cameco Resources	Smith Ranch-Highland Operation	Converse, Wyoming
Uranium Energy Corp. dba South Texas Mining Venture	Hobson ISR Plant	Karnes, Texas
	La Palangana	Duval, Texas
Mestena Uranium LLC	Alta Mesa Project	Brooks, Texas
Uranium One USA, Inc.	Willow Creek Project (Christensen Ranch and Irigaray)	Campbell and Johnson, Wyoming

The two major geographical areas of ISL mining and processing have been Texas and Wyoming. These areas are well suited to this ISL mining technology, in that the geology associated with the mineralized zone is contained by layers of impervious strata. Texas is the major producer of uranium from ISL operations, followed by Wyoming. ISL operations in South Dakota and Nebraska recover lesser amounts of uranium.

For the 2nd quarter of 2013, EIA (2013) identified the ISL facilities shown in Table 9 as being developed, or partially or fully permitted and licensed, or under construction. As discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining actions.

As the data in Table 9 show, there is considerable interest in ISL mining operations in the U.S. uranium belt. Many of the existing ISL operations are planning for expansion by preparing the license applications and other permitting documents. It is apparent that most domestic uranium recovery will be associated with existing and new ISL operations.

Table 9: ISL Facilities That Are Restarting, Expanding, or Planning for New Operations

Plant Owner	Plant Name	County, State (existing and *planned* locations)	Status, 2nd Quarter 2013
Powertech Uranium Corp	Dewey Burdock Project	*Fall River and Custer, South Dakota*	Developing
Uranium One Americas, Inc.	Jab and Antelope	*Sweetwater, Wyoming*	Developing
Hydro Resources, Inc.	Church Rock	*McKinley, New Mexico*	Partially Permitted And Licensed
Hydro Resources, Inc.	Crownpoint	*McKinley, New Mexico*	Partially Permitted And Licensed
Strata Energy Inc	Ross	*Crook, Wyoming*	Partially Permitted And Licensed
Uranium Energy Corp.	Goliad ISR Uranium Project	*Goliad, Texas*	Permitted And Licensed
Uranium One Americas, Inc.	Moore Ranch	*Campbell, Wyoming*	Permitted And Licensed
Lost Creek ISR, LLC	Lost Creek Project	Sweetwater, Wyoming	Under Construction
Uranerz Energy Corporation	Nichols Ranch ISR Project	Johnson and Campbell, Wyoming	Under Construction

Table 10 shows the size of the surface impoundments at ISL facilities. It is noteworthy that the operation of these facilities does not require impoundments nearly as large as the impoundments used at conventional mills. The impoundments are utilized for the evaporative management of waste water. The impoundments are small because a minimal percentage of the process water needs to be over-recovered to maintain solution flow to the recovery wells. The solution mining industry has used deep well injection for most of the waste water. All signs indicate that this type of waste water disposal will continue in the future.

Table 10 shows that all of the solution mining sites reviewed are using the deep well injection method.

Table 10: ISL Evaporation Pond Data Compilation

Operation	Evaporation pond?	Date pond was constructed	Size of pond	Synthetic liner under pond?	Leak detection system?	Deep well injection?
Cameco, Smith Ranch	East and west ponds	1986	8.6 acres	Yes	Yes, ponds have had leaks	Yes, used for most waste water, started in 1999
Cameco, Crow Butte	3 commercial ponds and 2 R&D ponds	R&D ponds 1990	Pond 1, 2, 5 850×200 ft Pond 3, 4 700×250 ft	Yes	Yes	Yes, all bleed stream
Hydro Resources, Crown Point	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Hydro Resources, Church Rock	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Uranium Resources Inc., Kingsville Dome	Two 120×120 ft ponds	1990	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Vasquez	Two 150×150 ft ponds	1990	150×150 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Rosita	Two 120×120 ft ponds	1985	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Mestena, Alta Mesa	Evaporation data not found					
STMV, La Palangana	Evaporation data not found					

3.3.1 Radon Emission from Evaporation and/or Holding Ponds

Unlike conventional mills, ISL facilities do not produce tailings or other solid waste products. However, they do generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, an extraction solution (lixiviant), composed of ground water enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes the uranium. The resulting "pregnant" lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field. This is accomplished by bleeding off a portion of the process flow. Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant washdown. One method to dispose of these liquid wastes is to evaporate them from ponds. Deep well injection and land application (i.e., irrigation) are other methods for disposing of the liquid wastes. For these disposal methods, the waste liquid is collected in holding ponds until a quantity sufficient for disposal has been accumulated.

As defined by the AEA of 1954, as amended, byproduct material includes tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content (42 USC 2014(e)(2)). Clearly, waste water generated during solution mining is within this definition of byproduct material and is thus subject to the requirements of Subpart W.

The waste water contains significant amounts of radium, which will radiologically decay and generate radon gas. Radon diffuses much more slowly in water than it does in air. For example, the radon diffusion coefficient in water is about 10,000 times smaller than the coefficient in air (i.e., on the order of 10^{-5} square centimeters per second (cm^2/sec) for water and 10^{-1} cm^2/sec for air (Drago 1998, as reported in Brown 2010)). Thus, if the tailings piles are covered with water, then most of the radon would decay before it could diffuse its way through the water. However, since over time periods comparable to the half-life of radon, there is considerable water movement within a pond, advective as well as diffusive transport of radon from the pond water to the atmosphere must be considered. The water movement is partly caused by surface wind currents, thermal gradients, mechanical disturbance from the mill discharge pipe, and biological disturbances (animals, birds, etc.). Dye movement tests indicate that for shallow (less than 1 meter) pond water, advective velocities may exceed 1–2 millimeters per minute, resulting in virtually no radon containment by the surface water. If shallow water movement is sufficient to remove radon from the tailings-water interface and transport it to the atmosphere in a short time (several hours), the radon flux from the shallow tailings is nearly as great as that from similar bare saturated tailings; hence, no significant radon attenuation is gained by covering the tailings with water (Nielson and Rogers 1986). Consequently, in order for a pond covering a tailings pile to be effective at reducing the release of radon, the pond water must be greater than 1 meter in depth.

Additionally, if there is radium in the pond water, radon produced from that radium could escape into the atmosphere. A review of the various models used for estimating radon flux from the

surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model (Schwarzenbach et al. 2003)), coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond's water and the assumption that radon is in secular equilibrium with the radium. The radon flux from the surface of an evaporation pond, as a function of the wind speed (for winds less than 24 miles per hour (mph)), can be estimated using this model with the following equation:

$$J = \frac{1.48 \times 10^{-4}}{e^{-0.351V}} C_w \qquad (3\text{-}1)$$

Where	J	=	Radon flux	(pCi/(m^2-sec))
	C_w	=	Concentration of radium in the water	(pCi/L)
	V	=	Wind speed	(m/sec)

Implicit in this model is the fact that in pond water the radon diffusion coefficient is 10^{-5} cm^2/sec and that the thickness of the stagnant film layer can be estimated by an exponential relationship with wind speed (Schwarzenbach et al. 2003).

Baker and Cox (2010) measured the radium concentration in an evaporation pond at the Homestake Uranium Mill Site at 165 pCi/L. Assuming a direct conversion to Rn-222 (165 pCi/L), the flux is estimated from equation 3-1 at 1.65 pCi/(m^2-sec). This is comparable to measurements of the flux, which averaged 1.13 pCi/(m^2-sec). However, the Homestake measurement method did not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data were found for measurements of the radon flux on evaporation ponds versus wind speed.

The model should not be used for wind speeds above 10 meters per second (m/sec) (24 mph). However, this is not expected to be a major limitation for estimating normal radon releases and impacts from operational evaporation ponds.

Using actual radium pond concentrations and wind speed data in equation 3-1, the radon pond flux was calculated from several existing ISL sites (SC&A 2010). Results showed that the radon flux ranged from 0.07 to 13.8 pCi/(m^2-sec). This indicates that the radon flux above some evaporation ponds can be significant (e.g., can exceed 20 pCi/(m^2-sec)). If such levels occur, there are methods for reducing the radium concentration in the ponds, the most straightforward being dilution. However, this solution is temporary, as evaporation will eventually increase the concentration. A second method is to use barium chloride ($BaCl_2$) to co-precipitate the radium to the bottom of the pond. The radon generated at the depths of the bottom sediments will decay before reaching the pond surface.

Again using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from three sites. The evaporation pond contribution to the site's total radon release was small (i.e., less than 1%).

Two additional sources of radon release were investigated: the discharge pipe and evaporation sprays. The discharge pipe is used to discharge bleed lixiviant to the evaporation pond. Radon

releases occur when the bleed lixiviant exits the pipe and enters the pond. The investigation found that these radon releases are normally calculated using the methodology in NUREG-1569, Appendix D (NRC 2003); thus, this source is currently included in the total radon releases reported for an ISL site. For a "typical" ISL, with a purge water radon concentration of 3.2×10^5 pCi/L and a purge rate of 5.5×10^5 liters per day (L/d) or about 100 gallons per minute (gpm), NUREG-1569, Appendix D, calculated the radon released from the discharge pipe to be 64 Ci/yr.

Spray systems are sometimes used to enhance evaporation from the ponds. A model to calculate radon releases during spray operation was developed (SC&A 2010). Also, data from ISL ponds were used to estimate this source of radon release. The radon releases from spray operations were reported to range from <0.01 to <3 pCi/(m^2-sec) (SC&A 2010). Furthermore, operation of the sprays would reduce the radon concentration within the pond; therefore, the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium). Hence, operation of spray systems to enhance evaporation is not expected to significantly increase the amount of radon released from the pond.

3.4 Heap Leaching

Heap leaching is a process by which chemicals are used to extract the uranium from the ore. A large area of land is leveled with a small gradient, layering it with HDPE or linear low-density polyethylene (LLDPE), sometimes with clay, silt or sand beneath the plastic liner. Ore is extracted from a nearby surface or an underground mine. The extracted ore will typically be run through a crusher and placed in heaps atop the plastic. A leaching agent (often H_2SO_4) will then be sprayed on the ore for 30–90 days. As the leaching agent percolates through the heap the uranium will break its bonds with the oxide rock and enter the solution. The solution will then flow along the gradient into collecting pools from which it will be pumped to an onsite processing plant.

In the past, there have been a few commercial heap leach facilities, but currently none are operating. However, this type of facility can be rapidly constructed and put into operation. Planning and engineering have begun for two heap leach facilities. At the spring 2010 joint NMA/NRC Uranium Recovery Workshop, the NRC identified two proposed heap leach projects, one in Wyoming and the other in New Mexico, as shown in Table 11. In addition to these two projects, Cotter has indicated to the Colorado Department of Public Health and Environment that it intends to retain the use of the secondary impoundment at its Cañon City site for heap leaching in the future (Hamrick 2011).

Table 11: Anticipated New Heap Leach Facilities

Owner	Site	State
Energy Fuels[4]	Sheep Mountain	Wyoming
Uranium Energy Corporation	Grants Ridge	New Mexico

Source: NMA 2010

[4] Energy Fuels acquired the Sheep Mountain Project through its acquisition of Titan Uranium Inc. in February 2012 (http://www.energyfuels.com/development_projects/sheep_mountain/, accessed 9/25/2013).

Higher uranium prices will likely lead to the processing of low-grade ore currently found in the uranium districts in Wyoming and New Mexico. Much of the low-grade ore currently exists in spoil piles that were not economical to truck to milling operations. Little processing equipment is necessary to bring heap leach operations on line. Additionally, minimal personnel are necessary to operate and monitor such an operation. However, the application of NESHAP Subpart W to heap leach facilities should be clarified (see Section 5.0). At a minimum, it is expected that these types of facilities will be limited in acreage according to the Subpart W standard and will be required to have synthetic liners with monitored leak detection systems.

Attempts have been made at heap-leaching low-grade uranium ore, generally by the following process:

(1) Small pieces of uncrushed ore are placed in a pile, or "heap", on an impervious pad of plastic, clay, or asphalt, to prevent uranium and other chemicals from migrating into the subsurface.

(2) An acidic solution is then sprayed onto the heap, which dissolves the uranium as it migrates through the ore.

(3) Perforated pipes under the heap collect the uranium-rich solution, and drain it to collection basins, from where it is piped to the processing plant.

(4) At the processing plant, uranium is concentrated, extracted, stripped, and dried to produce a material called "yellowcake."

(5) Finally, the yellowcake is packed in 55-gallon drums to be transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 10 shows a schematic of a typical heap-leaching uranium recovery facility.

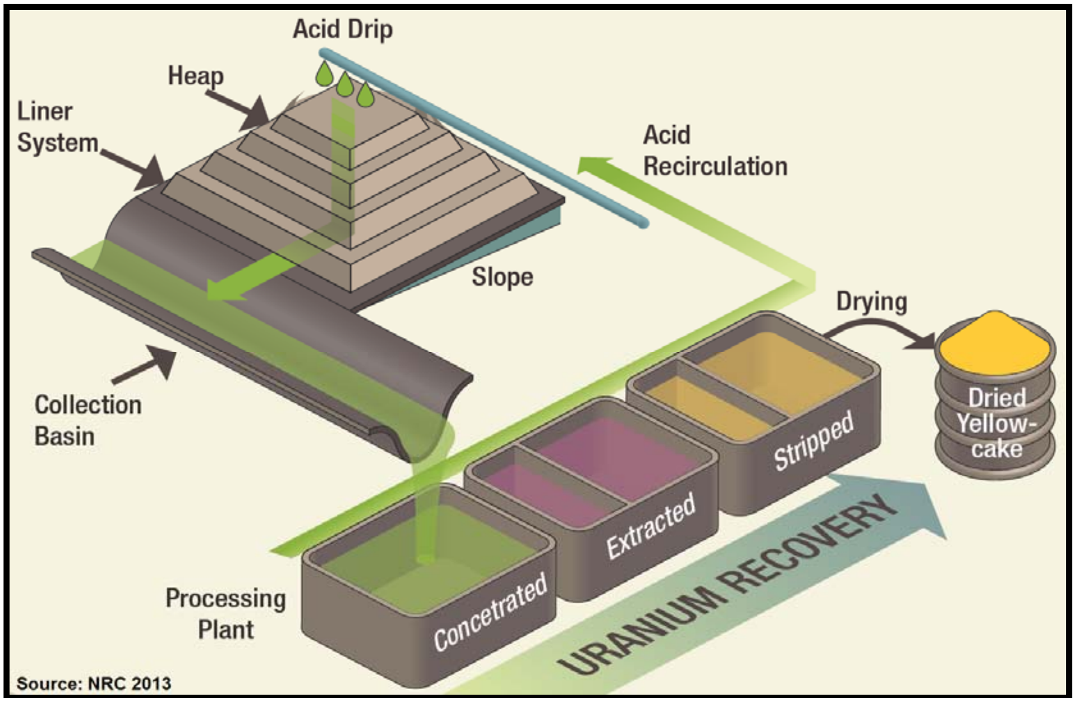


Figure 10: Typical Heap-Leaching Uranium Recovery Facility

Heap-leaching was not an industry trend; rather, it was an attempt to process overburden that contained a minimal concentration of uranium. Production records associated with this processing technique were not maintained, but certainly the technique represented less than 1% of the recovered uranium resources. Almost all of the conventional uranium recovery operations were stand-alone facilities that included the mining, milling, processing, drying, and containerization of the yellowcake product. The yellowcake product was then trucked to processing facilities that refined the raw materials into the desired product.

3.4.1 Sheep Mountain Mine, Energy Fuels, Fremont County, Wyoming

The Sheep Mountain mine, located at approximate 42º 24’ North and 107º 49’ West, has operated as a conventional underground mine on three separate occasions. Mining on the Sheep Mountain property started in 1956 and continued in several open pit and underground operations until 1982. The Sheep I shaft was sunk in 1974, followed by the Sheep II shaft in 1976. Production from the Sheep I shaft in 1982 was reported to be 312,701 tons at an average grade of 0.107% U_3O_8 (triuranium octoxide). In 1987, an additional 12,959 tons at 0.154% U_3O_8 were produced, followed by 23,000 tons at 0.216% U_3O_8 in 1988. The Sheep II shaft has had no production. The Congo Pit is essentially a single open pit which was being readied for development in the early 1980s, but plans were never realized because of the collapse of the uranium market. Feed from Sheep Mountain was processed at the Split Rock Mill, which was located north of Jeffrey City. Figure 11 shows the Sheep Mountain mine.

Figure 11: Sheep Mountain – Aerial View

Energy Fuels plans to develop the Sheep Mountain mine with both conventional underground and open pit mining, followed by heap leach extraction of the uranium with an ion-exchange recovery plant producing up to 1.5 million pounds of U_3O_8 per year. Energy Fuels' plans include the development of both the Sheep I and Sheep II underground mines, with access from twin declines. At its peak production, the underground mine will produce approximately 1.0 million pounds U_3O_8 per year. The Congo Pit will also be developed, producing an average of 500,000 pounds U_3O_8 per year. Recovery of the uranium will include heap leach pads using H_2SO_4 and a conventional recovery plant, through to yellowcake production on site. Assuming no re-use of heap pads, there will be 100 heap leaching cells, each with a capacity of 66,000 tons of material stacked to a height of 25 feet (ft) over an area of 40 ft by 100 ft. The mineral processing rate will be 500,000 tons per year or greater (Titan Uranium 2010).

Currently, the Wyoming Department of Environmental Quality has issued a fully bonded mining permit to Titan (now Energy Fuels). Energy Fuels is in the process of developing a source material license application for submittal to the NRC around mid-2011. The review and approval process is expected to take about 2 years (i.e., the NRC will complete it in mid-2013). Finally, the Plan of Operation (POO) is being developed and expected to be submitted to the U.S. Bureau of Land Management also around mid-2011. Submittal of the POO will trigger development of an environmental impact statement (EIS). This POO/EIS process is expected to be completed by the end of 2012 (Titan Uranium 2011).

3.5 Method 115 to Monitor Radon Emissions from Uranium Tailings

Subpart W (40 CFR 61.253) requires that compliance with the existing emission standards for uranium tailings be achieved through the use of Method 115, as prescribed in Appendix B to 40 CFR 61. Method 115 consists of numerous sections that discuss the monitoring methods that

must be used in determining the Rn-222 emissions from underground uranium mines, uranium mill tailings piles, phosphogypsum stacks, and other piles of waste material that emits radon.

For uranium tailings piles, Method 115, Section 2.1.3, specifies the minimum number of flux measurements considered necessary to determine a representative mean radon flux value for each type of region on an operating pile:

- Water covered area—no measurements required as radon flux is assumed to be zero.
- Water saturated beaches—100 radon flux measurements.
- Loose and dry top surface—100 radon flux measurements.
- Sides—100 radon flux measurements, except where earthen material is used in dam construction.

The requirement of 300 measurements may result in more measurements then are necessary under the Subpart W design standards. For example, under design standard 40 CFR 61.252(b)(2) for continuous disposal, only 10 acres are uncovered at one time. The 300 flux measurements on a 10-acre area translate into one measurement every 1,500 ft^2, or one every 40 ft. At the time Method 115 was developed and amended to Appendix B (i.e., 1989), the uranium tailings areas were much larger than the Subpart W design standards presently allow. For example, DOE/EIA-0592 (1995) indicates that some mills had tailings areas of over 300 acres (although not necessarily in a single pile).

Method 115, Section 2.1.6, indicates that measuring "radon flux involves the adsorption of radon on activated charcoal in a large-area collector." Since 1989, there have been advances in methods of measuring radon flux. George (2007) is particularly relevant in terms of radon measuring devices:

> *In the last 20 years, new instruments and methods were developed to measure radon by using grab, integrating, and continuous modes of sampling. The most common are scintillation cell monitors, activated carbon collectors, electrets, ion chambers, alpha track detectors, pulse and current ionization chambers, and solid state alpha detectors.*

In George (2007) radon detection is divided into:

I. Passive integrating radon measurements

(1) Activated carbon collectors of the open face or diffusion barrier type. Charcoal canisters often employ a gamma spectrometer to count the radon daughters as surrogates (bismuth-214, for example). Liquid scintillation vials also use alpha and beta counting. About 70% of radon measurements in the United States are canister type.

(2) Electret ion chambers are being used for 2–7 days duration to measure the voltage reduction (drop). The voltage drop on the electrets is proportional to the radon concentration. About 10%–15% of radon measurements use this methodology.

(3) Alpha track detectors are used for long-term measurements. Alphas from radon penetrate a plastic lattice, which is etched with acid, and the resulting tracks are counted. There is some use in the United States, but this is more popular in Europe.

II. Passive or active continuous radon measurements

(1) Scintillation cell monitors mostly include the flow-through type.

(2) Current and pulse ionization chambers (mostly passive).

(3) Solid state devices are either passive or active if they use a pump to move air through the sensitive volume of the monitor like the RAD 7, which uses a solid state alpha detector (passive implanted planar silicon (PIPS) detector).

Additionally, the Oak Ridge Institute for Science and Education (ORISE) compared various radon flux measurement techniques (ORISE 2011), including activated charcoal containers, the Electric Passive Environmental Radon Monitor (E-PERM) electret ion chamber, the AlphaGUARD specialized ionization chamber, semiconductor detectors to measure radon daughters, and ZnS(Ag) (silver doped zinc sulfide) scintillation detectors. ORISE stated that the last two techniques were not yet commercially available and that the AlphaGUARD detector was "expensive," and thus they are not currently candidates for radon flux monitoring of uranium tailings. Comparing the activated charcoal containers to the E-PERM, ORISE found that while both were easy to operate and relatively inexpensive, the E-PERM showed smaller variations in measurements, and the activated charcoal containers had higher post-processing costs. The only disadvantage of the E-PERM was that its Teflon disks must be replaced after each use. Based on this comparison, ORISE recommended that for a large number of measurements, such as those needed to comply with Subpart W, E-PERM flux monitors would be best.

This brief review of Method 115 demonstrates that its use can still be considered current for monitoring radon flux from uranium tailings. However, it is important to note that the specific design protocols were developed for use at larger tailings impoundments. Alternatively, many commercial enhancements to that design are widely available and in use today. Other forms of passive detectors, as well as active measurement detectors, are also acceptable alternatives to demonstrate conformance with the standard. In addition, the method as currently written has some elements and requirements that should be reviewed and possibly revised, particularly the location and the frequency of measurement. These would be better based on statistical considerations or some other technical basis. Additional discussion of the continued applicability of Method 115 appears in SC&A 2008, ORISE 2011, and George 2007.

4.0 CURRENT UNDERSTANDING OF RADON RISK

Subpart W regulates the emission of radon from operating uranium recovery facility tailings. To enhance the understanding of the need for Subpart W, this section presents a qualitative review and analysis of changes in the analysis of the risks and risk models associated with radon releases from uranium recovery tailings since the publication of the 1989 BID (EPA 1989). After presenting some brief radon basics, the analysis focuses on three areas that have evolved: radon progeny equilibrium fractions, empirical risk factors, and the development of dosimetric risk factors. Finally, Section 4.4 presents the results of a risk assessment performed using current methodology (i.e., CAP88, Version 3 (TEA 2007)), 2011 estimated population distributions, and historical radon release data. Section 4.4 also discusses and compares the current calculated risks to the 1989 risk assessment results, presented in Section 2.3.

4.1 Radon and Dose Definitions

Rn-222 is a noble gas produced by radioactive decay of Ra-226. As shown in Figure 12, one of the longer-lived daughters in the uranium (U)-238 decay series, Ra-226 is a waste product in uranium tailings and liquids from uranium recovery facilities. These include mills, evaporation and surge ponds, typically found in ISL facilities, and heap leach piles. Radium (and its daughter radon) is also part of the natural radiation environment and is ubiquitous in soils and ground water along with its parent uranium.

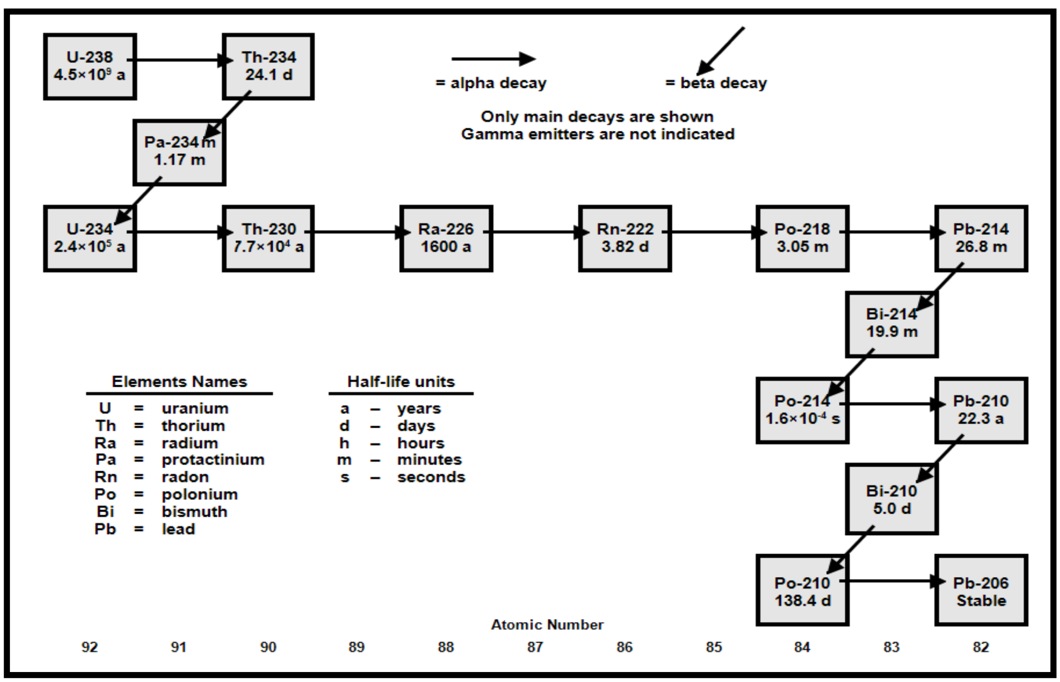


Figure 12: Uranium Decay Series

Radon, with a half-life of 3.8 days, decays into a series of short half-life daughter products or progeny. Being chemically inert, most inhaled radon is quickly exhaled. Radon progeny, however, are charged and electrostatically attach themselves to inhalable aerosol particulates, which are deposited in the lung or directly onto lung tissue. These progeny undergo decay,

releasing alpha, beta, and gamma radiation that interacts directly with lung tissue. Of these interactions, alpha particles from polonium-218 and polonium-214 are the most biologically damaging. The resulting irritation of lung cell tissue particularly from these alpha particles enhances the risk of developing a lung cancer. Determining an estimate of the risk of developing a cancer is of primary importance to establishing the basis for any regulatory initiatives.

4.2 Radon Risk Factors

In 1988, the National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) presented a report on the health risks of radon (BEIR IV, NAS 1988). BEIR IV derived quantitative risk estimates for lung cancer from analyses of epidemiologic data from underground miners. The risk factor presented in BEIR IV for radon was 350 cancer deaths per million person-WLMs[5] of exposure.

The International Commission on Radiological Protection (ICRP), in its Publication 50 (ICRP 1987), addressed the question of lung cancer risk from indoor radon daughter exposures. The ICRP Task Group took a direction quite different from that of the BEIR Committee. The Task Group reviewed published data on three miner cohorts: U.S., Ontario, and Czech uranium miners. When the ICRP 50 relative risk model was run with the 1980 U.S. life table and vital statistics, the combined male and female reference risk was calculated in the 1989 BID to be 4.2×10^{-4} cancer deaths per WLM.

In the 1989 BID, EPA averaged the male and female BEIR IV and ICRP 50 risk coefficients and adjusted the coefficients for background, so that the risk of an excess lung cancer death for a combined population (men and women) was 3.6×10^{-4} WLM^{-1}, with a range from 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1} (EPA 1989).

In addition to epidemiological radon risk coefficients, dosimetric models have been developed as a widely acceptable approach to determine the effects of exposures to radon progeny. One of the principal dosimetric models used to calculate doses to the lung following inhalation of radon and its daughters is the ICRP Human Respiratory Tract Model (HRTM), first introduced in ICRP Publication 66 (ICRP 1994). The ICRP used the HRTM to develop a compilation of effective dose coefficients for the inhalation of radionuclides, presented in Publication 72 (ICRP 1996).

Shortly after the publication of ICRP Publication 72, and using the information in that report, EPA developed Federal Guidance Report 13 (FGR 13) (EPA 1999)[6]. In addition to the risk factors given in FGR 13 itself, the FGR 13 CD Supplement (EPA 2002) provides dose factors, as well as risk factors, for various age groups. For this study, the dose and risk factors from the

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5 Radon concentrations in air are commonly expressed in units of activity (e.g., picocuries (pCi) or becquerels) per unit volume (e.g., liters (L)); however, radon progeny concentrations are commonly expressed as working levels (WLs). In a closed volume, the concentration of short-lived radon progeny will increase until equilibrium is reached, under these conditions, each pCi/L of radon will give rise to (almost precisely) 0.01 WL, or 100 pCi/L = 1 WL (EPA 2003). Exposure to 1 WL for 1 month (i.e., 170 hours) is referred to as 1 working level month (WLM).

6 Since FGR 13 was published, several organizations have produced updated radiation risk estimates. EPA 2011 reviewed the update risk estimates and concluded that the new mortality estimates do not differ greatly from those in FGR-13.

FGR 13 CD Supplement were used to calculate the dose and risk due to exposure to 1 WLM of radon and its progeny. The calculation assumed a radon airborne concentration of 100 pCi/L, a radon progeny equilibrium fraction of 0.4, a breathing rate of 0.9167 cubic meters per hour (m^3/hr), and an exposure duration of 170 hours.

The results of this calculation demonstrate that the FGR 13 based radon progeny lung dose conversion factor is between about 2.1 to 7.0 millisieverts (mSv)/WLM, depending on the age of the individual being exposed. The results also show that the lifetime fatality coefficient from lung exposure is between about 6×10^{-4} to 2.4×10^{-3} WLM^{-1}, depending on the exposed individual's age. This agrees well with the factor calculated from empirical data.

In conclusion, the radon progeny risk factor from FGR 13 of 6×10^{-4} WLM^{-1} used in this analysis falls within the risk factor range identified in the 1989 BID (i.e., 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1}), and is about 67% larger than the 3.6×10^{-4} WLM^{-1} radon progeny risk factor used in the 1989 BID. Thus, the radon progeny risk factor used in this Subpart W analysis updates the risk factor used in the 1989 BID to reflect the current understanding of the radon risk, as expressed by the ICRP and in FGR 13.

4.3 Computer Models

Various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium mines were compared. Seven computer programs were considered for use in the uranium tailings radon risk assessment: CAP88 Version 3.0, RESRAD-OFFSITE, MILDOS, GENII, MEPAS, AIRDOS, and AERMOD. A detailed selection process was used to select the program from the first five programs listed. AIRDOS was not included in the detailed selection process, since it is no longer an independent program, but has been incorporated into CAP88 Version 3.0. Because it calculates only atmospheric dispersion, but not radiological doses or risks, AERMOD was also not included. The five remaining programs received a score between 0 and 5 for each of the following 11 criteria: (1) Exposure Pathways Modeled, (2) Population Dose/Risk Capability, (3) Dose Factors Used, (4) Risk Factors Used, (5) Meteorological Data Processing, (6) Source Term Calculations, (7) Verification and Validation, (8) Ease of Use/User Friendly, (9) Documentation, (10) Sensitivity Analysis Capability, and (11) Probabilistic Analysis Capability. Also, each criterion had a weighting factor of between 1 and 2. The total weighted score was calculated for each code, and CAP88 was selected for use in this evaluation. A more complete discussion of the selection of the risk assessment computer code appears in SC&A 2010.

As described in Section 2.3, the 1989 BID used the computer codes AIRDOS-EPA, RADRISK, and DARTAB to calculate the risks due to radon releases from uranium tailings. Subsequent to the publication of the 1989 BID, CAP88 Version 3.0 was produced. CAP88 Version 3.0 was originally composed of the AIRDOS-EPA and DARTAB computer codes and the dose and risk factors from RADRISK (see Section 2.3). CAP88 Version 3.0 was first used for DOE facilities to calculate effective dose equivalents to members of the public to ensure compliance with the then-issued NESHAP Subpart H rules (TEA 2007). Currently, CAP88 Version 3.0 incorporates the dose and risk factors from FGR 13 for determining risks from radionuclides, including the radon decay daughters.

When calculating doses and risk from Rn-222, CAP88 Version 3.0 can be run in two different modes, either normally or in the "radon only" mode. When run in the normal mode, CAP88 Version 3.0 treats radon and its progeny as any other radionuclide and its progeny would be treated. That is, the radon is decayed as it travels from the release point to the dose receptor location, and the in-growth of the progeny is calculated. At the dose receptor location, doses are calculated assuming all the normal exposure pathways, including inhalation and air submersion, that are normally associated with radon doses, and also the exposure pathways from the longer lived radon progeny that deposit onto the ground, including ground shine and food ingestion. To perform these calculations, CAP88 Version 3.0 used the dose and risk factors from FGR 13.

In the "radon only" mode, CAP88 Version 3.0 calculates the risk from the radon WL concentration, but not the dose. The annual risk to an individual or population at a location is simply the WL concentration multiplied by a risk coefficient. The risk coefficient used by CAP88 Version 3.0 is 1.32 cancer fatalities per year per WL. Although this risk coefficient is not documented in any of the CAP88 Version 3.0 user manuals, so its origin is unknown, it can be derived from the CAP88 Version 3.0 output files. A risk coefficient of 1.32 WL-year^{-1} is equivalent to 2.56×10^{-2} cancer deaths per WLM, which is about two orders of magnitude larger than the risk coefficient discussed in Section 4.2. Thus, CAP88's "radon only" mode was not used to calculate the risk estimates that are summarized in the next section. Rather, the risk estimates are based on CAP88's atmospheric transport model (for radon decay and progeny buildup) and the radionuclide-specific risk factors from FGR 13.

4.4 Uranium Recovery Facility Radon Dose and Risk Estimates

To perform the CAP88 dose/risk analysis, three types of data were necessary: (1) the distribution of the population living within 80 km (50 mi) of each site, (2) the meteorological data at each site, particularly the wind speed, wind direction, and stability class, and (3) the amount of radon annually released from the site.

Dose/risk assessments were performed for the uranium recovery sites identified in Table 12, which include conventional uranium mills and ISL mines, plus two hypothetical generic sites developed to represent the western and eastern United States.

Table 12: Uranium Recovery Sites Analyzed

Mill / Mine	Type	State	Regulator	Latitude			Longitude		
				deg	min	sec	deg	min	sec
Crow Butte	In-Situ Leach	NE	NRC	42	38	41	-103	21	8
Western Generic	Conventional	NM	NRC	35	31	37	-107	52	52
Alta Mesa 1, 2, 3	In-Situ Leach	TX	State	26	53	59	-98	18	29
Kingsville Dome 1,3	In-Situ Leach	TX	State	27	24	54	-97	46	51
White Mesa Mill	Conventional	UT	State	37	34	26	-109	28	40
Eastern Generic	Conventional	VA	NRC	38	36	0	-78	1	11
Smith Ranch - Highland	In-Situ Leach	WY	NRC	43	3	12	-105	41	8
Christensen/Irigaray	In-Situ Leach	WY	NRC	43	48	15	-106	2	7
Sweetwater Mill	Conventional	WY	NRC	42	3	7	-107	54	41

Normally, the population doses and risks are calculated out to a distance of 80 km (50 mi) from the site. Therefore, it was necessary to know the population to a distance of 80 km from each site in each of the 16 compass directions. This information is not normally available from U.S. Census Bureau data. However, in 1973, EPA wrote a computer program, SECPOP (Sandia 2003), which would convert census block data into the desired 80-km population estimates for any specific latitude and longitude within the continental United States. The NRC adopted this program to perform siting reviews for license applications and has updated the program to use the 2000 census data. SC&A (2011) used the SECPOP program to estimate the population distribution around each site; that population was then modified to account for changes in the population from 2000 to 2010.

For those sites where site-specific meteorological data were identified, those site-specific data were used. For other sites, CAP88 Version 3.0 is provided with a weather library of meteorological data from over 350 National Weather Service stations. For sites without site-specific meteorological data, data from the National Weather Service station nearest the site were used.

Annual radon release estimates were determined for each site based on the available documentation for the site. For example, some sites reported their estimated radon release in their semiannual release reports, while other sites calculated their radon release as part of their license application or renewal application. Finally, for some sites, the annual radon release estimates were obtained from the NRC-produced, site-specific environmental assessment. If multiple documents provided radon release estimates for a particular site, the estimate from the most recent document was used. Consistent with the 1989 assessment, in order to bound the risks, radon releases were estimated from both process effluents and impoundments. Likewise, if both theoretical and actual radon release values were identified for a site, the actual radon release value was given preference.

Additional descriptions of each site's population, meteorology, and radon source term may be found in SC&A 2011. Doses and risks to the RMEI and to the population living within 80 km of the facility were calculated. The RMEI is someone who lives near the facility and is assumed to have living habits that would tend to maximize his/her radiation exposure. For example, the RMEI was assumed to eat all of his/her vegetables from a garden located nearest the facility, which is contaminated with radon progeny as a result of radon releases from the facility. On the other hand, population doses and risks are based on the number of individuals who live within 80 km of the facility. These people are also assumed to eat locally grown vegetables, but not necessarily from the garden located nearest the facility. The RMEI's dose and risk are included within the population dose and risk, since he/she lives within the 80-km radius.

Table 13 presents the RMEI and population doses and risks due to the maximum radon releases estimated for each uranium site.

Table 13: Calculated Maximum Total Annual RMEI, Population Dose and Risk

Uranium Site	Maximum Radon Release (Ci/yr)	Annual Dose		LCF(a, b) Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	0.5	1.2	2.9E-06	6.0E-07
White Mesa	1,750	5.2	12.0	3.4E-05	6.4E-06
Smith Ranch - Highlands	36,500	3.7	1.5	2.3E-05	7.7E-07
Crow Butte	8,885	2.7	3.3	1.7E-05	1.7E-06
Christensen/Irigaray	1,600	3.8	1.9	2.4E-05	9.9E-07
Alta Mesa	740	21.6	11.5	1.3E-04	6.1E-06
Kingsville Dome	6,958	58.0	11.3	3.8E-04	6.1E-06
Eastern Generic	1,750	200.3	28.2	1.4E-03	1.6E-05
Western Generic	1,750	5.1	6.0	2.7E-04	7.7E-06

(a)Latent Cancer Fatalities
(b)In this table all risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39.

Table 14 presents the RMEI and population doses and risks due to the average radon releases estimated for each uranium site. The risks were based on average radon releases to make it easier to convert these annual risk values into lifetime risk values. This conversion is done by simply multiplying the Table 14 values by the number of years that the facility operates for the population risk, or by the length of time that the individual lives next to the facility for the RMEI risk.

Table 14: Calculated Average Total Annual RMEI, Population Dose and Risk

Uranium Site	Average Rado n Release (Ci/yr)	Annual Dose		LCF(a) Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Populatio n	RMEI
Sweetwater	1,204	0.3	0.7	1.7E-06	3.5E-07
White Mesa	1,388	3.0	7.0	2.0E-05	3.7E-06
Smith Ranch - Highland s	21,100	2.2	0.9	1.3E-05	4.5E-07
Crow Butte	4,467	1.6	1.9	1.0E-05	1.0E-06
Christensen/Irigaray	1,040	2.2	1.1	1.4E-05	5.7E-07
Alta Mesa	472	12.5	6.7	7.6E-05	3.6E-06
Kingsville Dome	1,291	33.6	6.6	2.2E-04	3.5E-06
Eastern Generic	1,388	116.3	16.4	7.9E-04	9.2E-06
Western Generic	1,388	3.0	3.5	1.6E-04	4.4E-06

(a)Latent Cancer Fatalities

The dose and risk to an average member of the population within 0–80 km of each site may be calculated by dividing the population doses and risks from Table 13 and Table 14 by the population for each site. Table 15 shows the results of that calculation.

Table 15: Dose and Risk to an Average Member of the Population

Uranium Site	Dose (mrem)		LCF[(a)] Risk (yr^{-1})	
	Average Release	Maximum Release	Average Release	Maximum Release
Sweetwater	0.03	0.05	1.6E-07	2.7E-07
White Mesa	0.15	0.25	9.6E-07	1.6E-06
Smith Ranch - Highlands	0.03	0.05	1.7E-07	2.9E-07
Crow Butte	0.05	0.08	3.1E-07	5.3E-07
Christensen/Irigaray	0.06	0.11	3.8E-07	6.6E-07
Alta Mesa	0.03	0.05	1.6E-07	2.7E-07
Kingsville Dome	0.07	0.13	4.8E-07	8.3E-07
Eastern Generic	0.05	0.09	3.7E-07	6.4E-07
Western Generic	0.04	0.07	2.2E-06	3.8E-06

[(a)]Latent Cancer Fatalities

As Table 15 shows, the annual latent cancer fatality (LCF) risk to an average member of the population surrounding a uranium site ranges from 1.6×10^{-7} to 1.6×10^{-6} for the seven actual sites, and from 3.7×10^{-7} to 3.8×10^{-6} for the two hypothetical generic sites.

The study estimated that the annual fatal cancer risk to the RMEI ranges from 3.5×10^{-7} to 6.4×10^{-6} for the seven actual sites, and from 4.4×10^{-6} to 1.6×10^{-5} for the two hypothetical generic sites. The highest annual individual risk occurred at the Eastern Generic site, which is not surprising considering that the nearest individual was assumed to reside only about 1 mi from the hypothetical site. It is likely that during the site selection process for an actual facility, a site this close to residences would be eliminated and/or the design of the facility would include features for reducing radon emissions in order to reduce the RMEI risk.

The lifetime risk would depend on how long an individual was exposed. For example, for the seven actual sites analyzed, assuming that the uranium mill operates for 10 years, then the lifetime fatal cancer risk to the RMEI would be 3.5×10^{-6} to 3.7×10^{-5}. Alternatively, if it is assumed that an individual was exposed for his/her entire lifetime (i.e., 70 years), then the lifetime fatal cancer risk to the RMEI would be 2.45×10^{-5} to 2.59×10^{-4}. For the two hypothetical generic sites, the lifetime fatal cancer risk to the RMEI would be 4.4×10^{-5} to 9.2×10^{-5} assuming 10 years of mill operation, or 3.1×10^{-5} to 6.44×10^{-5} assuming 70 years of mill operation. The lifetime risk calculation uses only the average radon release results, because while the maximum could occur for a single year, it is unlikely that the maximum would occur for 10 or 70 continuous years.

The study also estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 km of the sites.

4.5 Summary of Radon Risk

This section described the evolution in the understanding of the risk presented by radon and its progeny since the 1989 BID was published. Additionally, the computer code CAP88 Version 3.0 was used to analyze the radon risk from seven operating uranium recovery sites and two generic sites.

The lifetime MIR calculated using data from seven actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments (see Section 2.3.1), while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments (see Section 2.3.2).

In protecting public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}) the lifetime MIR. Although the calculated high end of the lifetime MIR range is above 10^{-4}, the assumptions that radon releases occur continuously for 70 years and that the same RMEI is exposed to those releases for the entire 70 years are very conservative.

Similarly, the risk assessment estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years among the 1.8 million persons living within 80 km of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km of the sites was 0.0043, which was less than one case every 200 years for existing impoundments, and 0.014, or approximately one case every 70 years for new impoundments (see Sections 2.3.1 and 2.3.2).

5.0 EVALUATION OF SUBPART W REQUIREMENTS

The evaluation of Subpart W requirements required analyses of several items to determine if the current technology had advanced since the promulgation of the rule. These topics are listed below, along with the key issues addressed in this report to determine whether the requirements of Subpart W are necessary and sufficient.

5.1 Items Reviewed and Key Issues

Each of these items will be reviewed with reference to the relevant portions of this document:

(1) Review and compile a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed.

Key Issue – The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures and facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

(2) Compare and contrast those technologies with the engineering requirements of hazardous waste impoundments regulated under RCRA Subtitle C disposal facilities, which are used as the design basis for existing uranium byproduct material (i.e., tailings) impoundments.

Key Issue – All new impoundments shall adopt the design and engineering standards referred to through 40 CFR 192.32(a)(1).

(3) Review the regulatory history.

Key Issue – NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.

(4) Tailings impoundment technologies.

Key Issue – The emission limit for impoundments that existed as of December 15, 1989, has been demonstrated to be both achievable and sufficient to limit risks to the levels that were found to protect public health with an ample margin of safety.

The requirement that impoundments opened after December 15, 1989, use either phased or continuous disposal technologies as appropriate to ensure that public health is protected with an ample margin of safety, which is consistent with section 112(d) of the 1990 Amendments of the CAA, which requires standards based on GACT.

(5) Radon measurement methods used to determine compliance with the existing standards.

Key issue – The approved method (Method 115, 40 CFR 61, Appendix B) of monitoring Rn-222 to demonstrate compliance with the emission limit for impoundments that existed as of December 15, 1989, is still valid.

(6) Compare the 1989 risk assessment with current risk assessment approaches.

Key Issue – Adoption of a lower emission limit is not necessary to protect public health, as the current limit has been shown to be protective of human health and the environment. Impact costs associated with the limit are considered to be acceptable.

5.1.1 Existing and Proposed Uranium Recovery Facilities

Sections 3.2, 3.3, and 3.4 describe the three types of uranium recovery facilities: conventional mills, ISL facilities, and heap leach facilities. Each facility type is briefly described below.

Conventional Mills

Section 3 of this report presents a review of the existing and proposed uranium recovery facilities. As indicated, there are five conventional mills at various stages of licensing, with various capacities to receive tailings. Of these five conventional mills, only White Mesa is

operational. Some of these were constructed before December 15, 1989, and fall under the Subpart W monitoring requirement. Table 16 shows the current conventional mills with pre-December 15, 1989 conventional impoundments.

Table 16: Current Pre-December 15, 1989 Conventional Impoundments

Conventional Mill Name	Regulatory Status	Pre-December 15, 1989 Impoundments
Sweetwater	Standby,* license expires November 2014	37 acres not full
Shootaring Canyon	Standby,* license extension May 2013	Only 7 acres of impoundment filled
White Mesa	Active, license expires March 2015	Cell 2 closed, Cell 3 almost full

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

The White Mesa Mill (see Section 3.2.2) has one pre-1989 cell (Cell 3) that is authorized to accept tailings and is still open. Cell 2 is closed. Both cells are monitored for radon flux. The average radon flux for Cell 2 was calculated at 13.5 pCi/(m^2-sec), while that at Cell 3 was 8.9 pCi/(m^2-sec). The mill also uses an impoundment constructed before 1989 as an evaporation pond.

The Sweetwater Mill (see Section 3.2.1) has a 60-acre tailings management area with a 37-acre tailings impoundment of which 28 acres are dry with an earthen cover. The remainder is covered by water. The radon flux from this impoundment is monitored yearly. The average flux (using Method 115) for the entire impoundment was 6.01 pCi/(m^2-sec), including the water-covered area, which had an assumed flux of zero.

The Shootaring Canyon Mill (see Section 3.2.3) had plans for an upper and lower impoundment, but only the upper impoundment was constructed. As the mill operated for approximately 30 days, only about 7 acres of tailings were deposited in the upper impoundment. These have a soil cover. The average radon flux from the covered tailings was measured using Method 115 at 11.9 pCi/(m^2-sec) in April 2010.

The Piñon Ridge Mill (see Section 3.2.4) is a permitted conventional uranium recovery facility in Montrose County, Colorado. The facility has not been constructed; however, there are current activities at the site, including a pre-operational environmental monitoring program.

In-Situ Recovery

As discussed in Section 3.3, ISL was first conducted in 1963 and soon expanded so that by the mid-1980s, a fair proportion of the recovered uranium was by ISL. Table 8shows the ISL facilities in the United States that are currently operational. As previously discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining. Thus, approximately 23 facilities are restarting, expanding, or planning for new operations (see Table 9).

Of particular importance to Subpart W are the impoundments that are an integral part of all ISL facilities. These impoundments are required to maintain the hydrostatic gradient toward the leach

field to minimize excursions referred to as "flare," a proportionality factor designed to estimate the amount of aquifer water outside of the pore volume that has been impacted by lixiviant flow during the extraction phase. While these impoundments typically do not reach the size and scale of conventional tailings piles, they are an integral component of ISL, contain various amounts of radium, and can function as sources of radon gas. Section 3.3.1 provides the mathematical framework for estimating the quantity of radon being emitted from an impoundment. The subsequent discussion of Subpart W, including a proposed standard for impoundments constructed after December 15, 1989, will further evaluate this radon flux.

Heap Leach Facilities

The few commercial heap leach facilities established in the 1980s have been shut down. Recently, however, two heap leach facilities have been proposed: one in Wyoming (Sheep Mountain – Energy Fuels) and one in New Mexico (Grants Ridge, Uranium Energy Corporation) (see Section 3.4). If the price of uranium increases, then recovery of uranium from heap-leaching low-grade ores will become economically attractive and will likely lead to additional facilities. The question to be addressed from the standpoint of Subpart W is the radon flux released from the active heap leach pile. Also, once the uranium is removed from the ore in the heap leach pile, the spent ore becomes a byproduct material much like the tailings, albeit not mobile. This spent ore contains radium that releases radon. As the heap leach pile is constructed to allow lixiviant to "trickle through" the pile, these same pathways could allow for radon release by diffusion out of the spent ore and then through the pile, which is addressed under Subpart W.

5.1.2 RCRA Comparison

Both alternative disposal methods presented in Subpart W (work practices) require that tailings impoundments constructed after December 15, 1989, meet the requirements of 40 CFR 192.32(a)(1). Tailings impoundments include surface impoundments, which are defined in 40 CFR 260.10:

> *Surface impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.*

The above definition encompasses conventional tailings ponds, ISL ponds, and heap leach piles. The last is included as it is assumed that the heap leach pile will be diked or otherwise constructed so as not to lose pregnant liquor coming from the heap.

This being the case, 40 CFR 264.221(a) states that the impoundment shall be designed and constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Requirements of the liner system listed in 40 CFR 264.221(c) include:

(1)(i)(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life.

(1)(i)(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 ft (91 centimeters (cm)) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec).

The regulation also requires a leachate collection system:

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system.* This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period.

Other requirements for the design and operation of impoundments, given in 40 CFR 264 Subpart K, include construction specifications, slope requirements, and sump and removal requirements. The above requirements are important to new uranium containment/impoundment systems because of the potential that water will be used to limit the radon flux from a containment/impoundment. Thus, it is also important to minimize the potential for ground water or surface water contamination. For conventional mill tailings impoundments, the work practices require a soil cover. With heap leach piles, the moisture in the heap would limit radon during operations, and after operations, a degree of moisture would be required to ensure that the radon diffusion coefficient is kept low (see Section 5.4).

5.1.3 Regulatory History

Section 2.0 reviewed the regulatory history of Subpart W. This review indicates that NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA. The following presents the use of GACT (see Section 5.3) in detail and describes its use in conventional and other than conventional uranium recovery.

5.1.4 Tailings Impoundment Technologies

Sections 2.3.1 and 2.3.2 discuss tailings impoundment technologies. The two primary changes to the technology as it was previously practiced were first that owners and/or operators of conventional mill tailings impoundments must meet the requirements of 40 CFR 192.32(a)(1) and second that they must adhere to one of the two work practices previously discussed (for

impoundments constructed after December 15, 1989). Within these limits, tailings impoundment technologies have had no fundamental changes.

5.1.5 Radon Measurement Methods

As previously described, Subpart W defines two separate standards. The first states that existing sources (as of December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA that shows the results of the compliance monitoring (see Section 3.5). As pointed out in Appendix B, the focus of the monitoring was on the beaches, tops, and sides of conventional piles. The radon flux from the water-covered portion of the tailings pile was assumed to be zero. Although regulated under Subpart W, it is unclear how to monitor the radon flux off the surface of evaporation ponds at conventional mills, ISLs, or heap leach facilities. Since these ponds are considerably smaller than tailings impoundments, the solution was to specify that as long as the water cover is 1 meter or more during the active life of the pond, no monitoring is necessary (see Section 3.3.1).

Section 3.3.1 also shows that, for evaporation ponds at ISL facilities, the radon flux from the surface is a function of the wind speed and the concentration of radium in the water. Estimates using actual ISL data showed the contribution to the sites' total radon release to be less than 1% of the total. In any case, the radon flux can also be reduced by co-precipitating the radium using barium chloride ($BaCl_2$) co-precipitation treatment to reduce the radium concentration.

For impoundments constructed on or after December 15, 1989, monitoring is not required. Rather, Subpart W requires that these impoundments comply with one of two work practice standards: the first practice limits the size of the impoundment to 40 acres or less, which limits the radon source, while the second practice of continuous disposal does not allow uncovered tailings to accumulate in large quantities, which also limits radon emissions.

For evaporation ponds or holding ponds as in the pre-December 15, 1989, case, a 1-meter cover of water should be sufficient to limit the radon flux to the atmosphere (see Section 3.3.1). Thus, the proposed GACT is that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size or area restriction, and that during the active life of the pond at least 1 meter of liquid be maintained in the pond.

The last facility is the potential heap leach pile. Subpart W applies to the material in the pile as byproduct material is being generated. Considering a small section of the pile as the leach (acid or base) solubilizes the uranium, the material left is byproduct material. The result is a material similar to tailings and the heap is also wet. It is assumed that if the moisture content is greater than 30%, the heap is not dewatered. As long as the heap is not dewatered, the radon diffusion coefficient is such that minimal radon will escape the heap leach pile.

Heap Leach Radon Flux

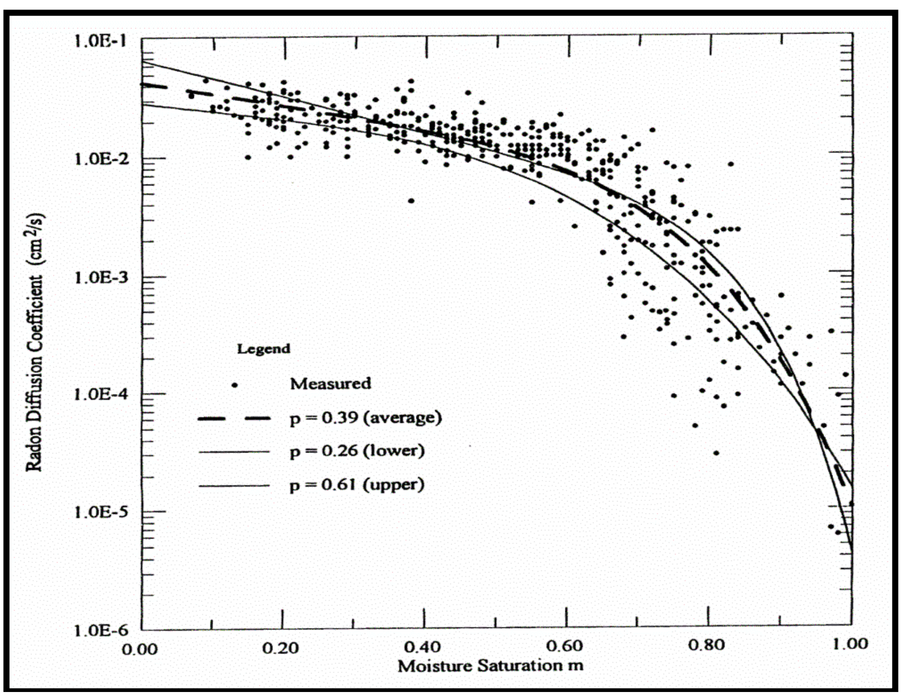
A possible source of radon from a heap leach pile is from the surface of the pile. Assuming that the heap pile is more than 1 or 2 meters thick, the radon flux from this configuration can be estimated from the following formula (NRC 1984):

$$J = 10^4 R \rho E \sqrt{\lambda D_e} \qquad (5\text{-}1)$$

Where

J	=	radon flux (pCi/(m^2-sec))
10^4	=	units conversion (cm^2/m^2)
R	=	specific activity of radium (pCi/g)
ρ	=	dry bulk density of material (1.8 g/cc)
E	=	emanation coefficient
λ	=	radon decay constant (2.11×10^{-6} sec^{-1})
D_e	=	radon diffusion coefficient (cm^2/sec)
	=	$D_0\, p \exp[-6\, m\, p - 6\, m^{14\, p}]$ (5-2)
D_0	=	radon diffusion coefficient in air (0.11 cm^2/sec)
m	=	moisture saturation fraction
p	=	total porosity

The above empirical expression for the radon diffusion coefficient was developed by Rogers and Nielson (1991), based on 1,073 diffusion coefficient measurements on natural soils. Figure 13 shows that the diffusion coefficient calculated using the empirical expression agrees well with the measured data points over the whole range of moisture saturation at which diffusion coefficient measurements were made.



Source: Rogers and Nielson 1991, as reported in Li and Chen 1994

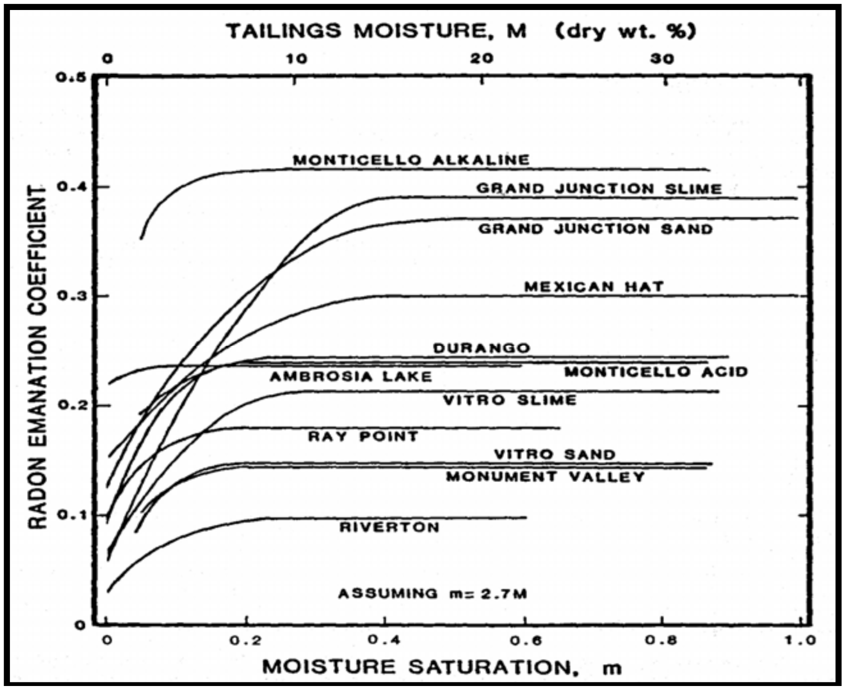
Figure 13: Diffusion Coefficient as a Function of Moisture Saturation

Figure 13 also demonstrates that as the moisture increases, the radon diffusion coefficient decreases significantly. This is because radon diffuses 10,000 times more slowly in water than it does in air (Drago 1998, as reported in Brown 2010). Therefore, adding moisture to the radium-containing material (whether it be a tailings pile or a heap pile) would decrease the diffusion coefficient, thereby increasing the time it takes for radon to diffuse out of the material and allowing more radon to decay before it can be released. As Figure 13 shows, the decrease in the radon diffusion coefficient can be significant, especially at high moisture levels.

However, in addition to the radon diffusion coefficient, the radon emanation coefficient is sensitive to the amount of moisture present. When a radium atom decays, one of three things can happen to the resulting radon atom: (1) it may travel a short distance and remain embedded in the same grain, (2) it can travel across a pore space and become embedded in an adjacent grain, or (3) it is released into a pore space. The fraction of radon atoms released into the pore space is termed the "radon emanation coefficient" (Schumann 1993). As soil moisture increases, it affects the emanation coefficient by surrounding the soil grains with a thin film of water, which slows radon atoms as they are ejected from the soil grain, increasing the likelihood that the radon atom will remain in the pore space. Research by Sun and Furbish (1995) describes this relationship between moisture saturation and the radon emanation rate:

> *The greater the moisture saturation is, the greater the possible radon emanation rate is. With moisture contents from 10% up to 30%, the recoil emanation rates quickly reach the emanation rate of the saturated condition. As the moisture reaches 30%, a universal thin film on the pore surface is formed. This thin film is sufficient to stop the recoil radon from embedding into another part of the pore wall.*

Figure 14 shows that the radon emanation coefficient can vary considerably for different tailings piles. Figure 14 also agrees with Sun and Furbish (1995) in that it shows that the emanation coefficient tends to level off when the moisture saturation level is above approximately 30%.



Source: NRC 1984

Figure 14: Emanation Coefficient as a Function of Moisture Content and Moisture Saturation

In conclusion, a moisture saturation level of up to about 30% tends to increase the radon emanation coefficient and decrease the radon diffusion coefficient, such that the amount of radon released from the pile could increase with increasing moisture. Above about 30% moisture saturation, the radon emanation coefficient is unchanged by increasing moisture, while the radon diffusion coefficient continues to decrease. Figure 15 shows the total effect of moisture on the radon flux. Equation 5-1 was used to develop Figure 15, along with the Rogers and Nielson (1991) empirical equation for the diffusion coefficient, an approximation of the Vitro Sand emanation coefficient from Figure 14, and a porosity of 0.39. Figure 15 does not show the radon flux values, since they would vary depending on the radium concentration and would not affect the shape of the curve.

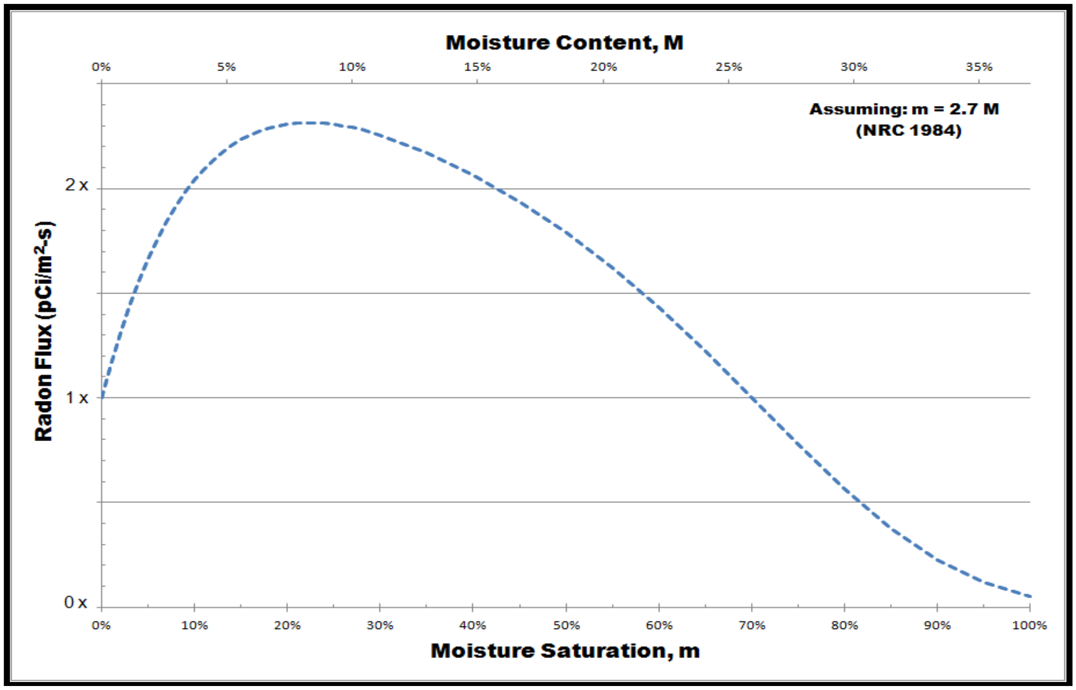


Figure 15: Radon Flux as a Function of Moisture Saturation and Moisture Content

Figure 15 shows that the radon flux starts low and increases as the moisture saturation increases due to the emanation coefficient. At between 20% and 30% moisture saturation, the flux reaches a peak that is about 2½ times the flux at zero moisture, after which the diffusion coefficient takes control and the flux decreases. Figure 15 is consistent with the results reported by Hosoda et al. (2007) in their study of the effect of moisture on the emanation of radon and thoron gases from weathered granite soil:

> *A sporadic increase in the radon and thoron exhalation rates was caused by the increase in the moisture content up to 8%* [27% moisture saturation]. *However, the exhalation rates showed a decreasing tendency with the increase in moisture content over 8%…, both measured and calculated radon exhalation rates had similar trends with an increase in the moisture content in the soil.*

The final point from Figure 15 is that the radon flux with a moisture content of 70% or greater is less than the flux at zero moisture, and that with a porosity of 0.39, 70% moisture saturation is equivalent to 27% moisture by weight. Thus, 30% moisture by weight would result in a radon flux significantly below the zero moisture flux.

5.1.6 Risk Assessment

Section 4.4 presents the results of a risk assessment performed for seven actual uranium recovery sites plus two generic uranium recovery sites. This risk assessment used the CAP88 Version 3.0 analytical computer model, which, as described in Section 4.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Additionally, this assessment used the latest radon dose and risk coefficients (i.e., millirem

(mrem)/picocurie (pCi) and LCF/pCi) from FGR 13. Both the 1989 assessment and this assessment used site-specific meteorological data. This assessment used 2000 census data, updated to 2010, whereas the 1989 assessment used 1983 data. Finally, as stated above, this assessment used actual historical radon releases from the uranium recovery sites, whereas because of the lack of site-specific data, the 1989 assessment assumed a radon release rate based on 1 pCi/(m^2-sec) Rn-222 emitted per pCi/g Ra-226 during both the operating, standby, drying, and/or disposal phase, and either 20 pCi/(m^2-sec) or the design flux (if known) during the post-disposal phase.

Section 4.4 presents the doses and risks calculated by the current risk assessment, and Section 4.5summarizes them. Additional information on the current risk assessment appears in SC&A 2011.

5.2 Uranium Recovery Source Categories

The preceding items and key issues are the basis for categorizing the major uranium recovery methods that will lead to methods of reducing radon emissions. The next section, which addresses the GACT standard, further discusses the applicability of the control measures. The following source categories represent a logical breakdown of the current uranium recovery industry:

Conventional Impoundments – Conventional impoundments are engineered structures for storage and eventual permanent disposal of the fine-grained waste from mining and milling operations (i.e., tailings). All conventional uranium recovery mills have one or more conventional impoundments. Table 3 shows conventional uranium milling facilities that are either built or licensed. This category will also include future conventional milling facilities.

Nonconventional Impoundments – At nonconventional tailings impoundments, tailings (byproduct material) are contained in ponds and covered by liquids. These impoundments are normally called “evaporation ponds” or “holding ponds.” Nonetheless, they contain byproduct material and, as shown in Section 3.3.1, can generate radon gas. This category is usually associated with ISL facilities (i.e., process waste water resulting from ISL operations (see Section 3.3)), but can also be associated with conventional facilities or heap leach facilities. While these ponds do not meet the work practices for conventional mills, they still must meet the requirements of 40 CFR 192.32(a)(1).

Heap Leach Piles – While no heap leach facilities are currently operating in the United States, at least one potential operation is expected to go forward (see Section 3.4). Heap leach piles contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct. As stated above, the design and operation of the heap leach is expected to follow the requirements of 40 CFR 192.32(a)(1).

5.3 The GACT Standard

Section 112(d) of the CAA requires EPA to establish NESHAPs for both major and area sources of HAPs that are listed for regulation under CAA section 112(c). Section 112(c) lists

radionuclides, including radon, as a HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for regulation of emissions of HAP. A "major source," other than for radionuclides, is defined as any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, in the aggregate, 10 tons per year or more of any HAP. For radionuclides, major source shall have the meaning specified by the Administrator by rule. An area source is a stationary source that is not a major source.

The regulation of HAPs at major sources is dictated by the use of MACT. Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating a MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

In 2000, EPA provided guidance to clarify how to apply the major source threshold for HAPs as defined in section 112(b) of the CAA Amendments of 1990. The guidance stated how to apply the major source threshold specifically for radionuclides:

> *There have been some questions about determining the major source threshold for sources of radionuclides. Section 112(a)(1) allows the Administrator to establish different criteria for determining what constitutes a major source of radionuclides since radionuclides emissions are not measured in units of tons. This, however, would not preclude a known radionuclide emitter that is collocated with other HAP-emitting activities at a plant site from being considered a major source due to the more common, weight-based threshold. The July 16, 1992, source category list notice did not include any sources of radionuclides because no source met the weight-based major source threshold, and the Agency had not defined different criteria. At the current time, there remain no listed major source categories of radionuclide emissions.* [EPA 2000b]

Based on this guidance, radon emissions from uranium recovery facility tailings impoundments are not a major source, and therefore, they are area sources for which the GACT standard is applicable. Unlike MACT, the meaning of GACT, or what is "generally available" is not defined in the act. However, section 112(d)(5) of the CAA Amendments for 1990 authorizes EPA to:

> *Promulgate standards or requirements applicable to [area] sources…which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.*

The Senate report on the legislation (U.S. Senate 1989) provides additional information on GACT and describes it as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic*

impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. Also considered are the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are also reviewed to determine whether such technologies and practices can be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

Thus, as presented above, "Promulgate standards or requirements … " does not limit EPA to strict "standard setting" in order to provide for the use of GACT. Rather, it allows EPA to promulgate at least two types of rules: rules that set emission levels based on specific controls or management practices (this is analogous to the MACT standard setting), and rules that establish permitting or other regulatory processes that result in the identification and application of GACT standards.

5.4 Uranium Recovery Categories and GACT

For conventional impoundments, the 1989 promulgation of Subpart W contained two work practice standards, phased disposal and continuous disposal (see Section 2.0, page 7). The work practice standards limit the size and number of the impoundments at a uranium recovery facility in order to limit radon emissions. The standards cannot be applied to a single pile that is larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). This approach was taken in recognition that the radon emissions from these impoundments could be greater if the piles were left dry and uncovered. The 1989 Subpart W also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for preventing and mitigating ground water contamination.

As discussed earlier, it is no longer believed that a distinction needs to be made for conventional impoundments based on the date when they were design and/or constructed. The existing impoundments at both the Shootaring Canyon (Section 3.2.3) and Sweetwater (Section 3.2.1) facilities can meet the work practice standards in the current Subpart W regulation. Impoundments at both these facilities have an area of less than 40 acres and are synthetically lined as required in 40 CFR 192.32(a). Also, the existing Cell 3 at the White Mesa mill will be closed in 2012 and replaced with impoundments that meet the phased disposal work practice standard (Section 3.2.2). Therefore, there is no reason not to apply the work practice standards required for impoundments designed or constructed after December 15, 1989, to these older impoundments. By incorporating these impoundments under the work practice standards, the requirement of radon flux testing is no longer needed and will be eliminated.

For the proposed GACT, the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards were evaluated. Liner requirements in use for the permitting of hazardous waste land disposal units under RCRA are contained in 40 CFR 264.221. Since 40 CFR 192.32(a)(1) references 40 CFR 264.221, it is the only requirement necessary for Subpart W, as the RCRA requirements are effective methods of containing tailings and protecting ground water while also limiting radon emissions. The regulation in 40 CFR 264.221 contains safeguards to allow for the placement of tailings and also provides for an early warning system in the event of a leak in the liner system. Therefore, the proposed GACT for conventional impoundments retains the two work practice standards and the requirements of 40 CFR 192.32(a)(1), because they have proven to be effective methods for limiting radon emissions while also protecting ground water. The NRC considers the requirements of 40 CFR 192.32(a) in its review during the licensing process.

For nonconventional impoundments, where tailings (byproduct material) are contained in ponds and covered by liquids, a new GACT is proposed. These facilities, called "evaporation ponds" or "holding ponds," also must meet the requirements of 40 CFR 192.32(a)(1). Specifically, these are the design and operating requirements for the impoundments. Because of the general experience that a depth of greater than 1 meter of liquid essentially reduces the radon flux of ponds to negligible levels, no monitoring is required for this type of impoundment. Given these factors, the following GACT is proposed:

> Nonconventional impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

For the last category, heap leach piles, an approach similar to that for nonconventional impoundments is proposed. As previously noted, these facilities contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct material, which is regulated under Subpart W. As for nonconventional impoundments, the design and operation of the heap leach pile is expected to follow the requirements of 40 CFR 192.32(a)(1). This also will prevent the loss of pregnant liquor (lixiviant with dissolved uranium) from spillage or leakage.

The byproduct material that makes up the volume of the spent heap leach pile is typically wet. As Figure 15 shows, as material goes from dry to wet the radon flux first increases before it decreases (the reasons for this are discussed in Section 5.1.5). While it is impossible to maintain a completely wet state, it is possible to maintain a sufficient percentage of moisture content to meet a goal that the radon flux in the wetted material is below what the flux would be if the material was dry. This percentage is related to the state or material being "dewatered." By way of definition, 40 CFR 61.251(c) states:

> Dewatered *means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight*.

Thus, the proposed GACT for heap leach piles is that, in addition to meeting 40 CFR 192.32(a)(1), operating heap leach piles must maintain a moisture content greater than

30% (equivalent to about 70% to 80% moisture saturation, as described in Section 5.1.5). This would, as indicated, ensure that the radon flux from the surface of the pile is quite low, i.e., at or below what the flux would be if the material in the pile was dry.

Since the purpose of this GACT is to control the radon emissions, it may not be critical to maintain the 30% moisture content in the lower levels/lifts of the pile. The reason for this is two-fold; first, radon generated in the lower levels would have to travel further in the pile before it would escape to the atmosphere, thereby giving it more time to decay within the pile, and second, radon from the lower layers will be slowed due to the 30% moisture content in the upper levels. Additionally, if inter-lift liners are provided when the pile is composed of multiple lifts, the inter-lift liner would act as a barrier to radon from the lower lifts, and thus mitigate the need for those lower lifts to maintain the 30% moisture content. On the other hand, because radon emission do not stop when active uranium leaching has ceased, it will be necessary to continue wetting the pile to maintain the 30% moisture content until a final reclamation cover (including a radon barrier layer) has been constructed over the pile.

5.5 Other Issues

During the review of Subpart W, several additional issues were identified. These are identified and discussed in this section.

5.5.1 Extending Monitoring Requirements

In reviewing Subpart W, EPA examined whether radon monitoring should be extended to all impoundments constructed and operated since 1989 so that the monitoring requirement would apply to all impoundments containing uranium byproduct material (i.e., tailings). EPA also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. As the rule currently exists, only pre-1989 conventional tailings impoundments are required to monitor for radon emissions, the requirement being an average flux rate of not more than 20 pCi/(m^2-sec). This is because, at the time of promulgation of the 1989 rule, EPA stated that the proposed work practice standards would be effective in reducing radon emissions from operating impoundments. Since the work practice standards could not be applied to pre-1989 facilities, and since EPA determined that it is not feasible to prescribe an emissions standard for radon emissions from a tailings impoundment (54 FR 9644 (FR 1989a)), the improved work practice standards would limit radon emissions by limiting the amount of tailings exposed.

Thus, it is not necessary to require radon monitoring at facilities constructed after the current Subpart W was promulgated (i.e., December 15, 1989). With respect to tailings and the amount of water used to cover them, the work practice standards (now proposed as GACTs) are also protective in preventing excess radon emissions. Further, for nonconventional impoundments, where there is no applicable radon monitoring method, the standing liquid requirement will effectively prevent all radon emissions from holding or evaporation ponds.

5.5.2 Clarification of the Term "Operation"

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement [which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W]. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

> <u>Operation.</u> Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

5.5.3 Clarification of the Term "Standby"

In the past, there has been confusion as to whether the requirements of Subpart W apply to a uranium recovery facility that is in "standby" mode. Although not formally defined in Subpart W, "standby" is commonly taken to be the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations. This period usually takes place when the price of uranium is such that it may not be cost effective for the facility to continue operations, and yet the facility fully intends to operate once the price of uranium rises to a point where it is cost effective for the facility to re-establish operations. As shown in Table 3, the Sweetwater and Shootaring Canyon mills are currently in standby. While in standby, a uranium recovery facility can change its license from an operating license to a possession only license, thereby reducing its regulatory obligations (and costs).

The addition of the following definition of "closure" into the Subpart W definitions at 40 CFR 61.251 would eliminate confusion:

> <u>Standby</u>. Standby means the period of time that a facility may not be accepting new tailings, but has not yet entered closure operations.

5.5.4 The Role of Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these western regions, the annual average precipitation (see Figure 16) falling on the impoundment is less than the annual average evaporation (see Figure 17) from the impoundment. Also, these facilities are located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. However, recent uranium exploration in the United States shows the potential to move eastward, into more climatologically temperate regions of the country. South central Virginia is now being considered for a conventional uranium mill (e.g., the Coles Hills, see Table 4). To determine whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

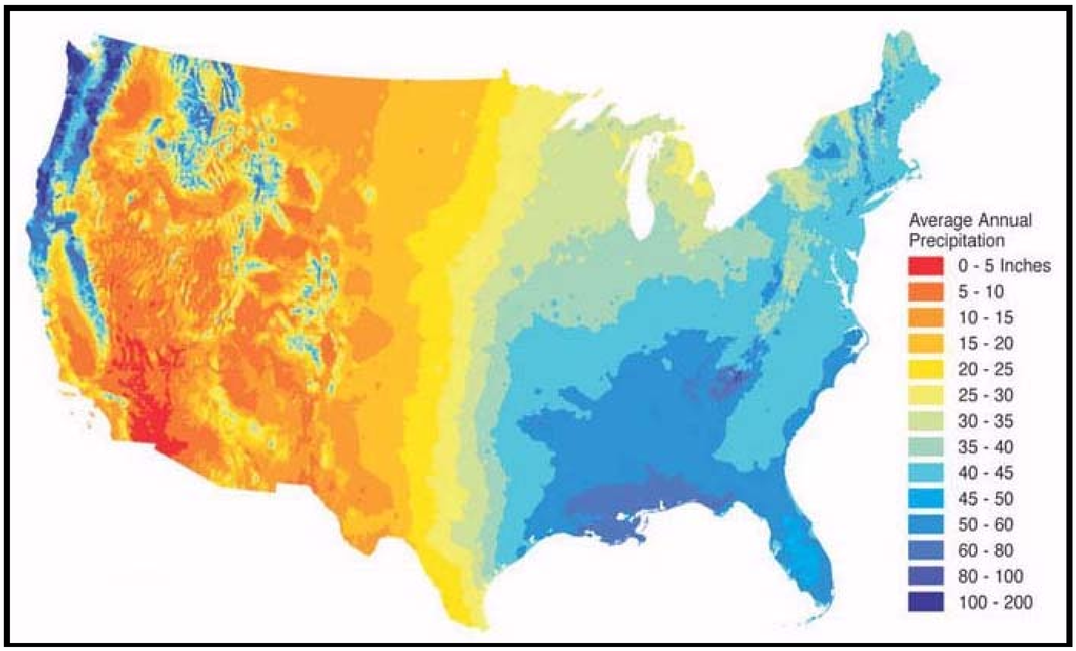


Figure 16: U.S. Average Annual Precipitation

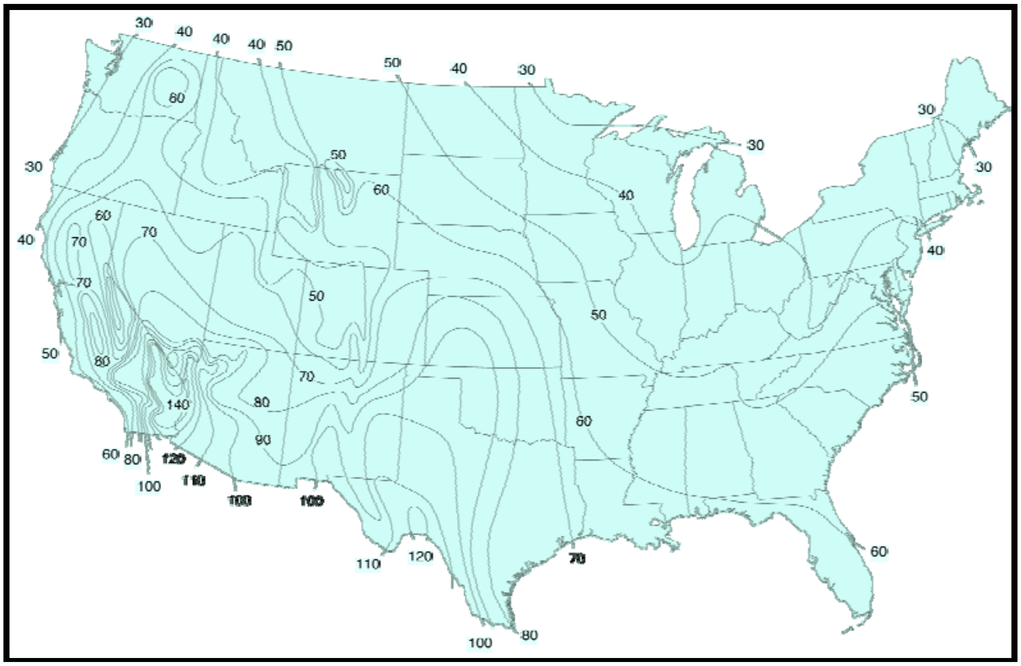


Figure 17: U.S. Mean Annual Evaporation

Subpart W requires owners and operators of uranium tailings impoundments to follow the requirements of 40 CFR 192.32(a). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that can be used to ensure proper operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action; rainfall; run-on; malfunctions of level controllers, alarms and other equipment; or human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive dike failure. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Uranium recovery facilities are already operating under the requirements of 40 CFR 192.32(a)(1), including compliance with 40 CFR 264.221(g) and (h), which will provide protection against the weather events likely to occur in the eastern United States.

6.0 ECONOMIC IMPACTS ASSOCIATED WITH REVISION/MODIFICATION OF THE SUBPART W STANDARD

This section contains the following economic impact analyses necessary to support any potential revision of the Subpart W NESHAP:

- Section 6.1 provides a review and summary of the original 1989 economic assessment and supporting documents.
- The baseline economic costs for development of new conventional mills and ISL and

heap leach facilities are developed and presented in Section 6.2.

- Section 6.3 presents the anticipated industry costs versus environmental and public health benefits to be derived from each of the four proposed GACT standards.

- Finally, Section 6.4 provides demographic data regarding the racial and socioeconomic composition of the populations surrounding uranium recovery facilities.

To assess the economic impacts of potential revisions to the Subpart W NESHAP, capital costs (including equipment costs), labor costs, taxes, etc., were obtained from actual recent cost estimates that have been prepared for companies planning to design, develop, construct, and operate uranium recovery facilities. For ISL facilities, two recent cost estimates were used as the basis for this analysis, while for conventional mills and heap leach facilities, a single cost estimate was used for each type of facility. Other necessary data, such as a discount rate, borrowing, and interest rates, were assumed, as described in Section 6.2.

Where feasible and appropriate, the economic models and recommendations from EPA's "Guidelines for Preparing Economic Analyses" (EPA 2010) were followed in assessing these economic impacts.

The cost and economic impact estimates described in Section 6.2 and 6.3 are based on industry data compiled in 2010-2011. Therefore, some of the analytical input values would differ somewhat if they were updated to reflect the latest information available. For example, the current long-term market price of uranium is approximately 17 percent lower than the $65 estimate that is used in the analysis (Cameco, 2013). The uranium mining industry is currently experiencing a volatile period resulting from the aftereffects of the Fukushima nuclear disaster. In particular, uranium demand has suffered from nearly all of Japan's workable reactors remaining offline since the March 2011 earthquake and tsunami triggered multiple meltdowns at the Fukushima Dai-ichi plant. Given the atypical post-Fukushima uranium market situation of the last couple of years and the prospects for a return to more normal market activity in the mid-term future,[7] we have decided not to update the analysis to incorporate the latest industry data. The results of the analyses described in this section are judged to be realistic estimates of the mid- to long-term impacts of the proposed Subpart W NESHAP.

6.1 1989 Economic Assessment

When Subpart W was promulgated in 1989, EPA performed both an analysis of the standard's benefits and cost and an evaluation of its economic impacts. Those analyses appear in the 1989 BID, Volume 3, Sections 4.4 and 4.5 (EPA 1989). This section briefly summarizes the Subpart W economic assessments performed in 1989.

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[7]These prospects include: the conclusion of the U.S.-Russia program that annually removes 24 million pounds of ex-military highly enriched uranium from the market via down-blending for use as U.S. nuclear fuel; the 60 nuclear power plants that are currently under construction throughout the world; efforts to reduce climate change emissions; and expectations that Japan will slowly begin restarting its 50 nuclear plants.

In these 1989 assessments, EPA evaluated the benefits and costs associated with three separate decisions. The first decision concerned a limit on allowable radon emissions after closure. The options evaluated included reducing radon emissions from the 20 pCi/(m^2-sec) limit to 6 pCi/(m^2-sec) and 2 pCi/(m^2-sec).

The second decision that EPA investigated was the means by which the emissions from active mills could be reduced to the 20 pCi/(m^2-sec) limit while operations continue. Emissions could be reduced by applying earth and water covers to portions of the dry areas of the tailings piles, which could reduce average radon emissions for the entire site to the 20 pCi/(m^2-sec) limit.

While the first two decisions were focused on tailings piles that existed at the time the standard was promulgated, the third concerned future tailings impoundments. EPA evaluated alternative work practices for the control of radon emissions from operating mills in the future. Options investigated include the replacement of the traditional single-cell impoundment (i.e., the 1989 baseline) with phased disposal or continuous disposal impoundments.

6.1.1 Reducing Post-Closure Radon Emissions from 20 pCi/(m^2-sec)

The 1989 BID estimated the total annual tailings piles radon emissions for standards of 20, 6, and 2 pCi/(m^2-sec) and calculated the cancers that could result from those emissions. It found that over a 100-year analysis period, the 6 pCi/(m^2-sec) option could lower local and regional risks by 3.6 cancers, while the incremental benefit of lowering the allowable flux rate from 6 to 2 pCi/(m^2-sec) was estimated at 1.0 cancer.

The increased costs associated with reducing the allowable flux rate from 20 to 6 pCi/(m^2-sec) were estimated to be between $113 and $180 million (1988$) ($205 and $327 million (2011$)), while attainment of a 2 pCi/(m^2-sec) flux rate was estimated to result in added costs of $216 to $345 million (1988$) ($393 to $627 million (2011$)).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. As the following excerpt from the preamble to the standard shows, for tailings piles at operating mills, EPA's decision was based on the very low risks associated with 20 pCi/(m^2-sec), rather than on a comparison of the benefits versus the costs of the alternative emission standards:

> *… the risks from current emissions are very low. A NESHAP requiring that emissions from operating mill tailings piles limit their emissions to no more than 20 pCi/(m^2-sec) represents current emissions. EPA has determined that the risks are low enough that it is unnecessary to reduce the already low risks from the tailings piles further.* [FR 1989a, page 51680]

While for tailings impoundments at inactive mills, the preamble presented a quantitative cost-benefit comparison as justification for maintaining the radon emission level at 20 pCi/(m^2-sec):

EPA examined these small reductions in incidence and maximum individual risk and the relatively large costs of achieving Alternative II [6 pCi/(m^2-s)]*, $158 million capital coat and $33 million in annualized costs and determined that Alternative I* [20 pCi/(m^2-s)] *protects public health with an ample margin of safety.* [FR 1989a, page 51682]

6.1.2 Reducing Radon Emissions During Operation of Existing Mills

The 1989 BID estimated the reduction in total risk that could be obtained by reducing radon emissions from active mills operating at that time to 20 pCi/(m^2-sec) through the application of an earthen cover and/or by keeping the tailings wet. The 1989 BID, Table 4-41, reported the risk reduction to be 0.17 fatal cancers for all active mills over their assumed 15-year operational life.

The 1989 BID, Table 4-42B, reported that the cost for providing the earthen covers and for keeping the tailings wet over the 15-year operating period was estimated to be $13.166 million (1988$) ($23.94 million in 2011$).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. EPA nonetheless decided that without these standards the risks were too high, as the following segment from the preamble to the standard indicates:

… EPA recognizes that the risks from mill tailings piles can increase dramatically if they are allowed to dry and remain uncovered. An example of how high the risks can rise if the piles are dry and uncovered can be seen in the proposed rule, 54 FR 9645. That analysis assumed that the piles were dry and uncovered and the risks were as high as 3×10^{-2} with 1.6 fatal cancers per year. Therefore, EPA is promulgating a standard that will limit radon emissions to an average of 20 pCi/m^2-s. This rule will have the practical effect of requiring the mill operators to keep their piles wet or covered. … [FR 1989a, page 51680]

6.1.3 Promulgating a Work Practice Standard for Future Tailings Impoundments

Section 4.4.3.1 of the 1989 BID provides the following explanations of the phased and continuous disposal options:

Phased Disposal

The first alternative work practice which is evaluated for model new tailings impoundments is phased disposal. In phased or multiple cell disposal, the tailings impoundment area is partitioned into cells which are used independently of other cells. After a cell has been filled, it can be dewatered and covered, and another cell used. Tailings are pumped to one initial cell until it is full. Tailings are then pumped to a newly constructed second cell and the former cell is dewatered and then left to dry. After the first cell dries, it is covered with earth obtained from the construction of a third cell. This process is continued sequentially. This system

minimizes emissions at any given time since a cell can be covered after use without interfering with operations as opposed to the case of a single cell.

Phased disposal is effective in reducing radon-222 emissions since tailings are initially covered with water and finally with earth. Only during a drying-out period of about 5 years for each cell are there any [significant] *radon-222 emissions from the relatively small area. During mill standby periods, a water cover could be maintained on the operational cell. For extended standby periods, the cell could be dewatered and a dirt cover applied.*

Continuous Disposal

The second alternative work practice, continuous disposal, is based on the fact that water can be removed from the tailings slurry prior to disposal. The relatively dry dewatered (25 to 30% moisture [by weight]*) tailings can then be dumped and covered with soil almost immediately. No extended drying phase is required, and therefore very little additional work would be required during final closure. Additionally, ground water problems are minimized.*

To implement a dewatering system would introduce complications in terms of planning, design, and modification of current designs. Acid-based leaching processes do not generally recycle water, and additional holding ponds with ancillary piping and pumping systems would be required to handle the liquid removed from the tailings. Using trucks or conveyor systems to transport the tailings to disposal areas might also be more costly than slurry pumping. Thus, although tailings are more easily managed after dewatering, this practice would have to be carefully considered on a site-specific basis.

Various filtering systems such as rotary vacuum and belt filters are available and could be adapted to a tailings dewatering system. Experimental studies would probably be required for a specific ore to determine the filter media and dewatering properties of the sand and slime fractions. Modifications to the typical mill ore grinding circuit may be required to allow efficient dewatering and to prevent filter plugging or blinding. Corrosion-resistant materials would be required in any tailings dewatering system due to the highly corrosive solutions which must be handled. …

The committed fatal cancer risk[8] from the operation of model baseline (single-cell), phased disposal, and continuous disposal impoundments, as determined by the 1989 BID, is shown in Table 17. Table 17 shows the following:

[during] *the operational period the risk of cancer is reduced, relative to the single cell baseline, by 0.129 if phased disposal is adopted and by 0.195 if the continuous single cell method is used. The risk reduction associated with using the continuous single cell relative to the phased approach is 0.066. In the post-operational phase, phased disposal raises the risk by 0.012 relative to the*

[8] "Committed fatal cancer risk" is the likeliness that an individual will develop and die from cancer at some time in the future due to their current exposure to radiation. "Committed fatal cancer risk" is sometimes referred to as "latent cancer fatality risk."

baseline, while the continuous single cell approach lowers it by 0.017 relative to the baseline and by 0.028 relative to phased disposal. [EPA 1989, Section 4.4.3.3]

Table 17: Radon Risk Resulting from Alternative Work Practices (Committed Cancers)

	Baseline (Single Cell)	Phased Disposal	Continuous Disposal
Operational Period (0 to 20 years)	0.282	0.153	0.087
Post-Operations (21 to 100 years)	0.264	0.276	0.247
Total	0.546	0.429	0.334

Source: EPA 1989, Table 4-45

Concerning the cost to implement the work practices, the 1989 BID indicates the following:

the phased … disposal impoundment is the most expensive design ($54.02 million [1988$]*), while the single cell … impoundment ($36.55 million* [1988$]*) is the least expensive. Costs for the continuous single cell design ($40.82 million* [1988$]*) are only slightly more than those of the single cell impoundment, although the uncertainties surrounding the technology used in this design are the largest*. [EPA 1989, Section 4.4.3.4]

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. However, as the following excerpt from the preamble to the standard shows, EPA was concerned about the uncertainty of the benefits and costs analysis that had been performed for this portion of the regulation. Ultimately, the Agency based its decision on the small cost to implement the work practices, rather than on weighing the benefits versus the costs:

The uncertainty arises because it assumes a steady state industry over time. If the uranium market once again booms there would be increased risks associated with Alternative I [one large impoundment (i.e., baseline)]. *If the industry then experienced another economic downturn, the costs of Alternative I would increase because of the economic waste that occurs when a large impoundment is constructed and not filled. The risks can also increase if a company goes bankrupt and cannot afford the increased costs of closing a large impoundment and the pile sits uncovered emitting radon. The risks can also increase if many new piles are constructed, creating the potential for the population and individual risks to be higher than EPA has calculated.*

These uncertainties significantly affect the accuracy of the [benefits and costs] *analysis and given the small cost of going to Alternatives II* [phased disposal] *and III* [continuous disposal]*, EPA has determined that in order to protect the public*

with an ample margin of safety, both now and in the future, new mill tailings impoundments must use phased or continuous disposal. [FR 1989a, page 51680]

6.1.4 Economic Impacts

To determine the economic impacts of the proposed Subpart W on the uranium production industry, the 1989 BID evaluated two extreme cases; in the first, it was assumed that "no portion of the cost of the regulation can be passed on to the purchaser of U_3O_8," and in the second, it was "assumed that the uranium production industry is able to recover the entire increase in the tailings disposal cost by charging higher U_3O_8 prices." These two cases provided the lower and upper bound, respectively, of the likely economic impacts of Subpart W on the uranium production industry.

As described in Section 3.1, from 1982 to 1986, the uranium production industry had been contracting and experiencing substantial losses because of excess production capacity. The 1989 Subpart W economic impact assessment concluded that if the industry had to absorb the costs of implementing the regulation, the present value cost at that time would be about five times the industry losses from 1982 to 1986, or equal to about 10% of the book value of industry assets at that time, or about 15% of industry's liabilities.

Alternatively, if the uranium production industry could pass on the Subpart W implementation costs to its electric power industry customers, who would likely pass on the costs to the electricity users, the 1989 economic impact assessment concluded:

> *The revenue earned by the* [electric power] *industry for generating 2.4 trillion kilowatt hours of electricity in 1986 was 121.40 billion dollars. The 1987 present value of the regulation (estimated to be $250 million) is less than 1 percent (.06%) of the U.S. total electric power revenue for the same year.* [EPA 1989, Section 4.5.1]

The 1989 BID drew no conclusions regarding what effects, if any, these impacts would have on the uranium production industry's financial health.

6.2 U_3O_8 Recovery Baseline Economics

This section presents the baseline economics for development of new conventional mills, ISL facilities, and heap leach facilities. EPA's economic assessment guidelines define the baseline economics as "a reference point that reflects the world without the proposed [or in the case of Subpart W, the modified] regulation. It is the starting point for conducting an economic analysis of potential benefits and costs of a proposed [or modified] regulation" (EPA 2010, Section 5).

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the conventional mill, data from the proposed new mill at the Piñon Ridge project in Colorado were used. For the ISL facility, data from two proposed new facilities were used: the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production

period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Sections 6.2.1 through 6.2.4 provide details of how the project-specific cost data were converted into base case economic data, and Section 6.2.5 presents a short sensitivity study for the conventional mill and heap leach cost estimates. Because two projects were analyzed, a sensitivity analysis of the ISL cost estimates was not performed.

Next it was necessary to estimate the annual amount of U_3O_8 that is currently used and how much would be required in the future. For these estimates, data from the Energy Information Administration (EIA) were used. Section 6.2.6 describes how the EIA data were coupled with specific cost data for the uranium recovery facilities to determine the cost and revenue estimates provided in Table 18.

Table 18: Uranium Recovery Baseline Economics (Nondiscounted)

Cost / Revenue	2009 ($1,000)		2035 Projections ($1,000)*			
	2009$	2011$	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$347,000	$462,000	$502,000	$473,000	$605,000	$706,000
U_3O_8 Cost	$298,000	$372,000				
Conventional			$398,000	$375,000	$480,000	$560,000
In-Situ Leach			$396,000	$373,000	$477,000	$557,000
Heap Leach			$356,000	$335,000	$429,000	$501,000
Mixed Facilities			$392,000	$368,000	$472,000	$553,000

* See the discussion below and in Section 6.2.6 for a description of these cases.

Table 18 presents uranium production industry cost and revenue for six cases. The first two cases are based on the actual amount of U_3O_8 produced in the United States in 2009 (the last year for which data are available). The two 2009 cases differ in that the first is based on 2009 dollars, including the weighted-average price of $48.92 per pound for uranium of U.S. origin, while the second was based on assumptions used in this analysis (i.e., 2011 dollars and a U_3O_8 price of $65 per pound). The remaining four cases in Table 26 are all based on the assumptions used in this analysis, but differ in the amount of U_3O_8 assumed to be produced in the United States in 2035. The first through third 2035 cases are for the Reference, Low Nuclear Production, and High Nuclear Production projected 2035 nuclear power usage, as estimated by the EIA (see Section 6.2.6). It should be noted that most of the U_3O_8 used in the United States is from foreign suppliers. The fourth 2035 case (Ref Low Import) increases the percentage of U.S.-origin uranium to 20% for the reference nuclear power usage estimate.

For each of the four 2035 projection cases, four assumptions were made regarding the source of the U_3O_8: (1) all U_3O_8 is from conventional mills, (2) all U_3O_8 is from ISL (recovery) facilities, (3) all U_3O_8 is from heap leach facilities, and (4) the U_3O_8 is from a mixture of uranium recovery facilities (see Section 6.2.6, page 87, for a definition of the mixture). Table 19 shows that the type of uranium recovery facility assumed makes only about a 15% difference between the lowest cost (heap leach) and the largest cost (ISL) recovery type facility.

6.2.1 Conventional Mill Cost Estimate

The base case economic costs for development of a new conventional mill were developed using data from the proposed new mill at Piñon Ridge in Colorado (Edge 2009). Although cost estimates for other conventional mills were reviewed, e.g., Coles Hill (Lyntek 2010), Church Rock (BDC 2011), the Piñon Ridge cost estimate was selected for the base case because it is believed to be the furthest advanced. Specific cost data obtained from the Piñon Ridge project (i.e., Edge 2009, Tables 7.1-1 and 7.1-2) were for land acquisition and facility construction, operating and maintenance, decommissioning, and regulatory oversight. While the Piñon Ridge project supplied the mill design parameters and the overall magnitude of the cost, additional data on the breakdown of the capital and operating costs were taken from the Coles Hill uranium project located in Virginia (Lyntek 2010).

Assumptions used to develop the conventional mill base case cost estimate include:

- As per the Piñon Ridge project, the mill design processing capacity is1,000 tons per day (tpd), and the licensed operating processing rate is 500 tpd.

- The operating duration is 40 years, as per the Piñon Ridge project.

- Because they were more detailed, the Coles Hill cost data (Lyntek 2010) were used to generate a percentage breakdown of the Piñon Ridge cost estimates (Edge 2009). For example, the Piñon Ridge operating cost estimate was divided into labor, power and water, spare parts, office and lab supplies, yellowcake transportation, tailings operating, and general and administration (G&A) using Coles Hill percentages. Thus, the Coles Hill data affected the detailed breakdown of the cost estimate, but not its magnitude.

- Ore grades are 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The base case analysis did not use the Piñon Ridge project's average ore grade of 0.23%.

- The U_3O_8 recovery rate is 96% per the Piñon Ridge project.

- A line of credit (LoC) of $146 million has an annual interest rate of 4%, with a 20-year payback period.

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

The Piñon Ridge project data do not include the costs to develop and/or operate a uranium mine. Rather, it is assumed that these costs are included in the cost of the uranium ore purchased for processing at the Piñon Ridge mill. Mine development and operating costs are included for the conventional mill based on an average of the open pit and underground mine costs developed for the heap leach facility (see Section 6.2.2).

Table 19 presents the cost estimates that were developed for the conventional uranium mill.

Table 19: Conventional Mill Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)	7,000	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	15,958	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$1,037,299	$617,406	$369,925
Line of Credit (LoC)	$146,000	$154,891	$167,155
Mine Costs			
Development	$82,553	$49,136	$29,440
Operating	$261,195	$155,465	$93,148
Mill Costs			
Construction	$134,073	$139,870	$147,761
Mill Direct	$53,136	$55,434	$58,562
Mill Indirect	$9,547	$9,960	$10,522
Mill Contingency	$15,671	$16,348	$17,271
Tailings	$55,718	$58,128	$61,407
Operating and Maintenance	$124,397	$74,042	$44,363
Labor (All inclusive)	$59,267	$35,276	$21,136
Power & Water	$19,400	$11,547	$6,919
Spare Parts	$15,883	$9,454	$5,664
Office and Lab Supplies	$5,117	$3,045	$1,825
Yellowcake Transportation	$2,239	$1,332	$798
Tailings Operating	$22,492	$13,387	$8,021
G&A	$8,634	$5,139	$3,079
Taxes, Claims, and Royalties	$119,289	$71,002	$42,541
Regulatory Oversight	$11,800	$7,191	$4,541
Decommissioning/Closure	$12,000	$3,679	$801
Repay LoC, plus Finance Costs	$214,859	$169,561	$130,302
Total Cost	$968,801	$675,085	$495,978

The cash balance for the conventional mill (as well as the other uranium recovery facilities) is shown in Figure 18. Figure 18 shows that until production year 18, when the LoC has been paid off, the conventional mill is just breaking even.

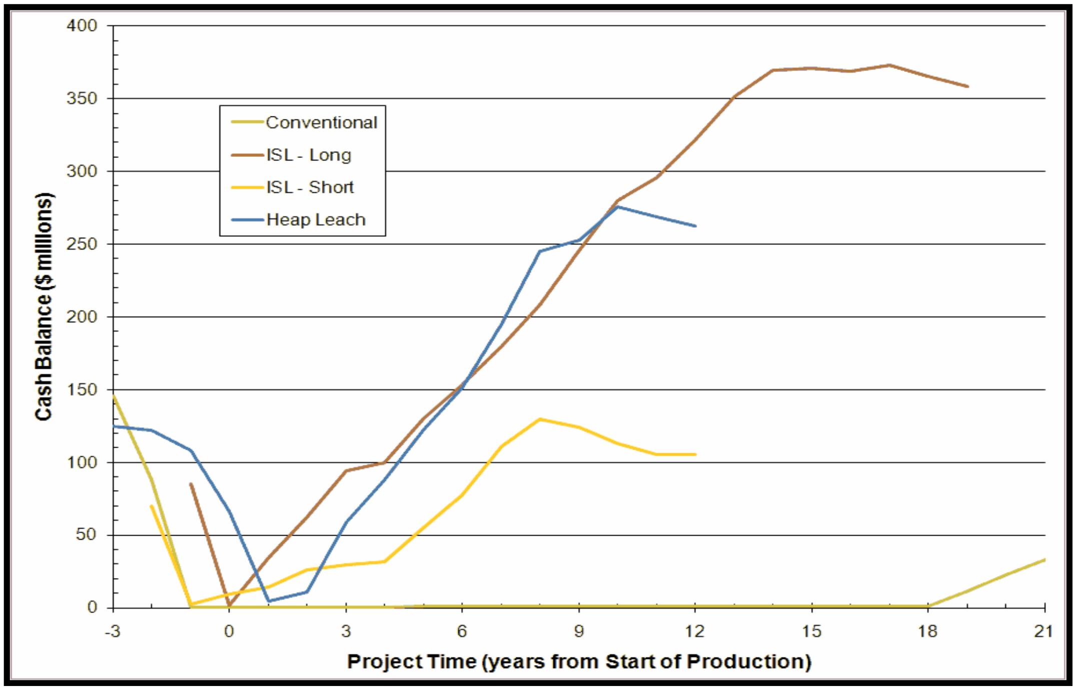


Figure 18: Estimated Cash Balance – Reference Cases

Figure 19 shows the assumed annual U_3O_8 production from the conventional mill (as well as the other uranium recovery facilities). Based on the assumptions used for the base case, the conventional mill produces the least amount of U_3O_8 annually.

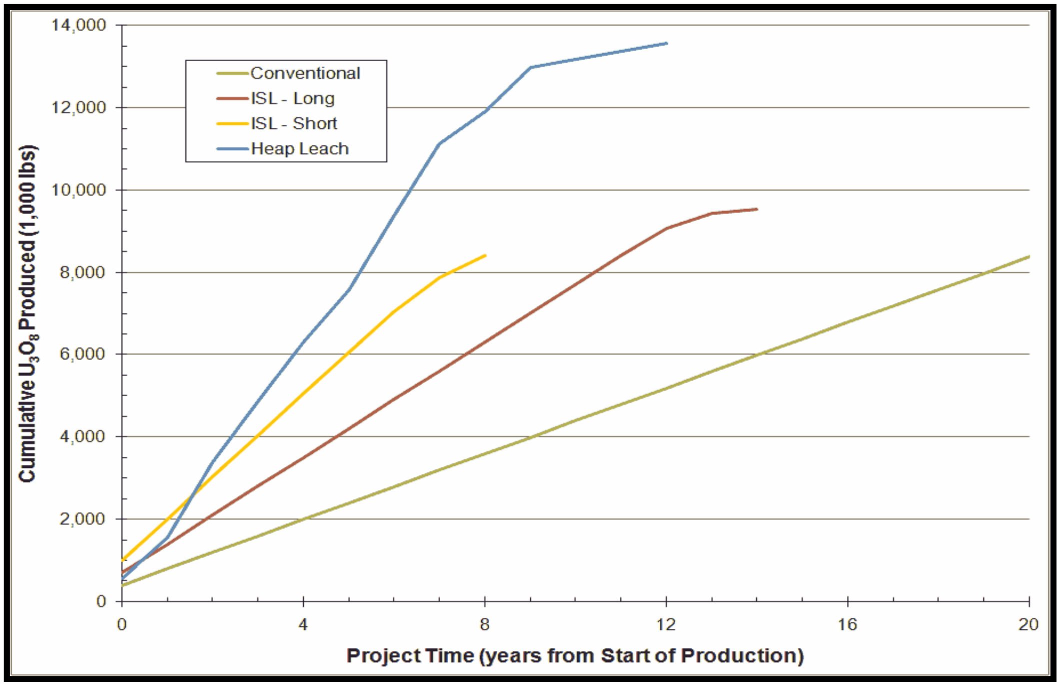


Figure 19: Cumulative U_3O_8 Projections – Reference Cases

6.2.2 Heap Leach Facility Cost Estimate

The base case economic costs for development of a new heap leach facility were developed using data from the proposed new facility at Sheep Mountain in Wyoming (BRS 2011). Specific assumptions used to develop the base case cost estimate for the heap leach facility include:

- The operating duration is 13 years, as per the Sheep Mountain project's uranium production schedule. The annual amount of ore processed averaged 491,758 tons, with maximum and minimum annual processing rates of 916,500 and 74,802 tons, respectively (BRS 2011, page 86).

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the facility capital costs in a manner that would be inconsistent with the estimates provided for the Sheep Mountain project. If additional uranium ore production is to be modeled, a second (or more) and identical heap leach facility should be assumed, either concurrently or sequentially with the first facility.

- Consistent with the Sheep Mountain project cost assumptions, capital investment, totaling $14.177 million, was assumed during the operational period to add more heap leach pads and to replace underground mine equipment. Two additional heap pads were assumed, the first after approximately one-third of the ore is processed, and the second after two-thirds is processed.

- Ore grades were 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The Sheep Mountain project's ore

grades averaged 0.132% for underground and 0.085% for open-pit produced uranium (BRS 2011, page 86).

- The U_3O_8 recovery rate varied between 89% and 92%, depending on the year of operation, as per the Sheep Mountain project (BRS 2011, page 86).

- The cost of open pit mining is $19.28 per ton of ore, while the cost of underground mining is $52.24 per ton, and the cost of heap leach processing is $13.51 per ton (BRS 2011, pages 87 and 88).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $125 million has an annual interest rate of 4%, with a 15-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 20 presents the cost estimates developed for the heap leach facility.

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)			
Open Pit	2,895	N.C.	N.C.
Underground	3,498	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	13,558	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$881,266	$764,878	$643,637
Line of Credit (LoC)	$125,000	$136,591	$153,130
Open Pit Mine			
Capital Costs	$14,590	$14,590	$14,590
Operating Costs	$55,817	$49,594	$42,879
Underground Mine			
Capital Costs	$60,803	$59,880	$58,997
Operating Costs	$182,723	$156,753	$130,078
Heap Pads/Processing Plant			
Capital Costs	$51,885	$50,788	$49,690
Operating Costs	$86,367	$74,973	$63,130

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Shared Costs			
Predevelopment	$10,630	$11,149	$11,874
Reclamation Costs	$17,000	$14,755	$12,416
Taxes, claims, and royalties	$101,346	$87,961	$74,018
Repay LoC/Finance Costs	$168,640	$146,659	$125,441
Total Cost	$749,801	$667,102	$583,114

Figure 18 end of year cash balance for the heap leach facility (as well as for the other uranium recovery facilities). Figure 18 shows that by production year 4, the heap leach facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the heap leach facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the heap leach facility consistently produces the largest quantity of U_3O_8 annually.

6.2.3 In-Situ Leach (Long) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Centennial project in Weld County, Colorado (SRK Consulting 2010b). The Centennial project is expected to have a production period of 14–15 years, which is a long duration for an ISL facility. Annual cost estimates for the Centennial project are provided on pages 117 through 123 of SRK Consulting 2010b. SRK Consulting 2010b, Section 17.11, discusses the basis for the Centennial project cost estimate. Specific assumptions used to develop the ISL (Long) facility base case cost estimate for this analysis include:

- The operating duration is 15 years, as per the Centennial project's uranium production schedule (SRK Consulting 2010b, pages 117 and 120). The facility produces about 700,000 lb of U_3O_8 annually in the first 12 years, then reduces production until only 92,000 lb is produced in the last (15^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Centennial project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Long) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010b, pages 17–24). Funds for restoration are set aside beginning in the second production year and continuing until the end of the project (i.e., year 19 after the start of production).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $85 million has an annual interest rate of 4%, with a 10-year payback period.
- Taxes, claims, and royalties total 11.5% of revenue.
- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 21 presents the cost estimates that were developed for the ISL (Long) facility.

Table 21: In-Situ Leach (Long) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	9,522	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$618,930	$501,943	$390,820
Line of Credit (LoC)	$85,000	$87,550	$90,950
Operating Cost Summary			
Central Plant/Ponds	$66,536	$52,000	$38,805
Satellite/Well Field	$126,708	$109,218	$90,279
Restoration	$11,257	$8,353	$5,844
Decommissioning	$14,818	$9,175	$5,017
G&A Labor	$16,379	$12,849	$9,732
Corporate Overhead	$6,350	$4,969	$3,761
Contingency	$48,410	$39,313	$30,687
Total Operating Costs	$290,458	$235,877	$184,124
Capital Cost Summary			
CPP/General Facilities	$55,097	$54,027	$52,739
Well Fields	$14,209	$13,868	$13,450
G&A	$13,605	$13,428	$13,212
Mine Closure	$12,585	$7,244	$3,555
Miscellaneous	$14,246	$11,055	$8,202
Contingency	$21,948	$19,924	$18,232
Total Capital Costs	$131,690	$119,546	$109,390
Severance, Royalty, Tax	$71,177	$57,723	$44,944
Repay LoC/Finance Costs	$104,797	$92,076	$78,758
Total Cost	$598,122	$505,223	$417,216

Figure 18 shows the end of year cash balance for the ISL (Long) facility (as well as for the other uranium recovery facilities). Figure 18 shows that by the second year of production, the ISL (Long) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Long) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Long) facility produces an annual

amount of U_3O_8 that is midway between the amounts produced by the conventional mill and heap leach facility.

6.2.4 In-Situ Leach (Short) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Dewey-Burdock project in South Dakota (SRK Consulting 2010a). The Dewey-Burdock project is expected to have a production period of about 9 years, which is representative for an ISL facility. SRK Consulting 2010a, pages 96 through 105, presents annual cost estimates for the Dewey-Burdock project, and Section 17.11 of that report discusses the basis for the Dewey-Burdock project cost estimate. Specific assumptions used to develop the ISL (Short) facility base case cost estimate for this analysis include:

- The operating duration is 9 years, as per the Dewey-Burdock project's uranium production schedule (SRK Consulting 2010a, pages 117 and 120). The facility produces about 1,010,000 lb of U_3O_8 annually in the first 6 years, then production declines until only 533,000 lb is produced in the last (9^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Dewey-Burdock project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Short) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010a, pages 17–18). Funds for restoration are set aside beginning in the first production year and continuing for 2 years after production ends (i.e., production year 11).

- The price for U_3O_8 is \$65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of \$70 million has an annual interest rate of 4%, with a 5-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 22 presents the cost estimates developed for the ISL (Short) facility.

Table 22: In-Situ Leach (Short) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	8,408	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$546,520	$491,065	$431,098
Line of Credit (LoC)	$70,000	$72,100	$74,900
Operating Cost Summary			
Central Plant/Ponds	$31,036	$27,485	$23,754
Satellite/Well Field	$130,056	$116,074	$100,788
Restoration	$6,159	$5,207	$4,234
Decommissioning	$11,614	$8,594	$5,835
G&A Labor	$9,750	$8,637	$7,500
Corporate Overhead	$3,900	$3,450	$2,994
Contingency	$38,503	$33,889	$29,021
Total Operating Costs	$208,558	$186,696	$162,811
Capital Cost Summary			
CPP/General Facilities	$49,338	$50,297	$51,598
Well Fields	$37,127	$36,951	$36,787
G&A	$2,507	$2,463	$2,414
Mine Closure	$22,460	$16,640	$11,314
Miscellaneous	$9,565	$8,253	$6,927
Contingency	$19,707	$19,593	$19,545
Total Capital Costs	$140,705	$134,197	$128,586
Severance, Royalty, Tax	$83,444	$74,899	$65,698
Repay LoC/Finance Costs	$78,619	$74,171	$68,984
Total Cost	$511,326	$469,963	$426,079

Figure 18 shows the end of year cash balance for the ISL (Short) facility (as well as for the other uranium recovery facilities). Figure 18 shows that in its first year of production, the ISL (Short) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Short) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Short) facility produces an annual amount of U_3O_8 that is midway between the amounts produced by the ISL (Long) and heap leach facilities.

6.2.5 Cost Estimate Sensitivities

The uranium recovery facility base case cost estimates developed in Sections 6.2.1 through 6.2.4 were based on the specific assumptions presented in each section. One of the key parameters for the determination of the conventional mill and heap leach facility cost estimates is the assumed ore grade. Table 23 presents the average ore grades reported by the EIA for U.S.-origin uranium during 2009. These are the ore grades assumed for the conventional mill and heap leach facility cost estimates. As noted in Section 6.2.2, the ore grades assumed in the Sheep Mountain project

cost estimate (BRS 2011) were very similar to the Table 23 values. However, as noted in Section 6.2.1, the Piñon Ridge project cost estimate used an ore grade of 0.23%, which is considerably higher than the Table 23 EIA values (Edge 2009).

Table 23: Uranium Ore Grade		
Mine Type	Ore Output (1,000 tons)	Ore Grade
Underground	76,000	0.142%
Open Pit	54,000	0.086%
In-Situ Leach	145,000	0.08%
Total	275,000	0.10%

Source: EIA 2011b

Table 24 summarizes the cost estimates for all four uranium recovery facilities developed in Sections 6.2.1 through 6.2.4. It includes the heap leach facility and conventional mill sensitivity cost estimates based on the alternate ore grade and ore processing assumptions just described.

Table 24: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC[1]	w/o LoC[2]
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87
Conventional as Designed	$26.57	$25.45
Heap Leach w/ High Grade Ore	$22.13	$20.59

1 Total cost minus LoC revenue divided by the pounds of U_3O_8 produced

2 Total cost minus LoC revenue minus finance charge divided by the pounds of U_3O_8 produced.

The Piñon Ridge mill is being designed to process 1,000 tpd of uranium ore but, because of current market conditions, is currently being licensed to process only 500 tpd. The cost estimate in Section 6.2.1 is based on a conventional mill processing 500 tpd. As an alternative, the conventional mill cost estimate is recalculated using an ore grade of 0.23% and an ore processing rate of 1,000 tpd. These results have been included in Table 24.

So that the facilities maintain a positive cash flow, the analyses in Sections 6.2.1 through 6.2.4 assumed that each facility would be provided with an LoC to cover the construction and development costs. The amount of the LoC was determined by how much cash was necessary to maintain a positive cash balance. The interest on the LoC was assumed to be 4%, and the period to repay the LoC varied for each facility, depending on the amount of the LoC. The interest paid on the LoC is included in the facility cost estimates developed in Sections 6.2.1 through 6.2.4.

The right hand column of Table 24 shows what the facility-specific cost estimates would be without an LoC (and if the cash flow was allowed to be negative), or if the interest rate was 0%.

Figure 20 shows the effect of alternative assumptions on the cash balance.

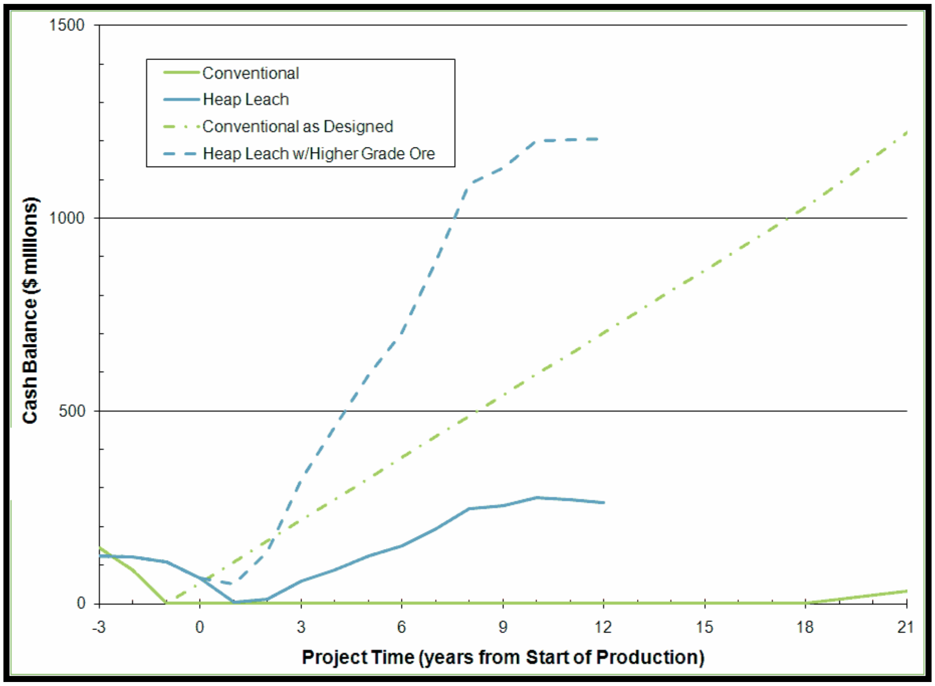


Figure 20: Estimated Cash Balance – Sensitivity Cases

Figure 21 shows the effect of the alternative assumptions on the U_3O_8 production. The obvious conclusion is that the higher the ore grade, the more U_3O_8 is produced, and therefore, the uranium recovery facility is more profitable.

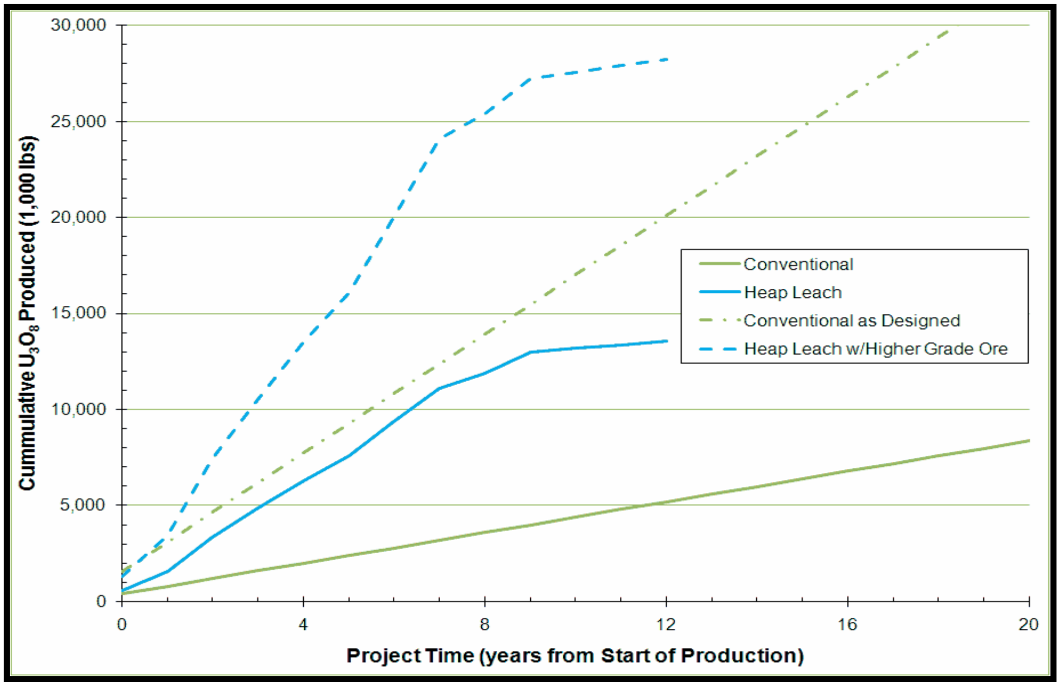


Figure 21: Cumulative U_3O_8 Projections – Sensitivity Cases

6.2.6 Annual Total U_3O_8 Cost Estimates

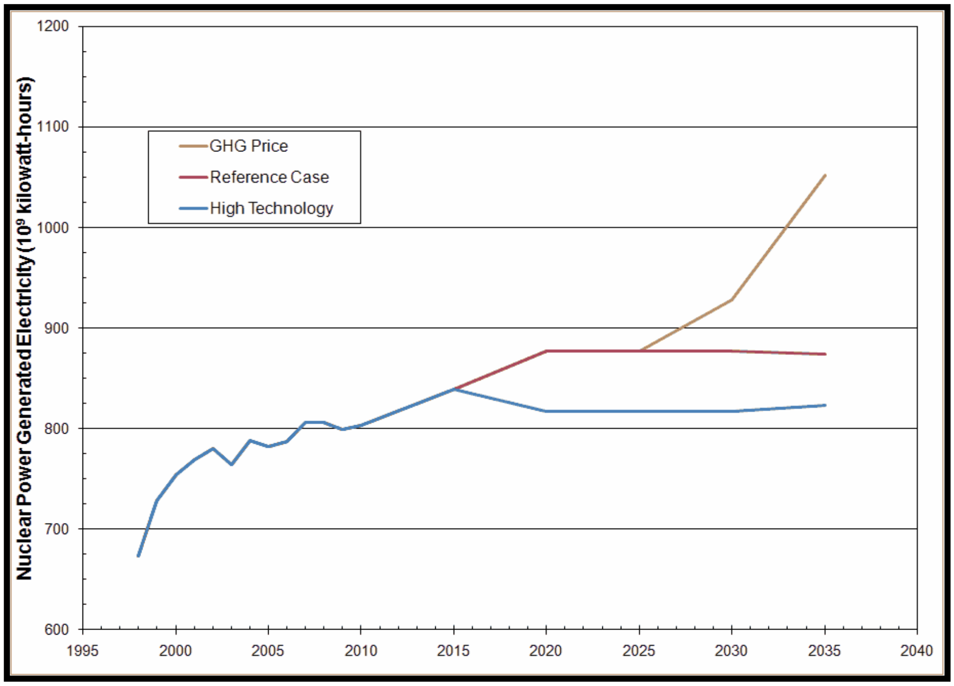
In Sections 6.2.1 through 6.2.4, base case cost estimates were developed for a conventional mill, a heap leach facility, and two ISL facilities. These individual uranium recovery facility cost estimates are used together with the actual 2009 (the last year for which data are available) and projected 2035 U.S.-origin uranium production.

For 2009, the EIA reports that 7,100 thousand pounds of U_3O_8 was produced in the United States (EIA 2011b). For this analysis, the total produced was divided between conventional mills and ISL facilities using the EIA-provided ore outputs, shown in Table 23, which resulted in 3,356,000 lb for conventional mills and 3,744,000 lb for ISL facilities. No heap leach facilities were operating in 2009, so the heap leach production is zero. The 2009 uranium recovery facility total cost and revenue estimates given in Table 18 (page 75) are based on these U_3O_8 production figures and the individual facility unit cost estimates given in Table 24.

These calculated 2009 economic data are based on 2011 dollars (e.g., \$65 per pound of U_3O_8). The 2009 calculated economic data are adjusted to 2009 dollars by assuming an average U_3O_8 price of \$48.92 lb^{-1} (EIA 2010) and adjusting the costs by the ratio of the 2009 energy consumer price index (CPI, 202.301) to the 2011 energy CPI (252.661) (BLS 2011, Table 25). Table 18 (page 75) also gives the 2009 economic data estimates based on 2009 dollars for uranium recovery facilities.

The next part of the analysis was to estimate the future value of the U.S. uranium recovery industry. To this end, it was necessary to estimate the future size of the nuclear power industry. The EIA (2011a) analyzed the U.S. energy outlook for 2011 and beyond, including the contribution from nuclear power. The EIA analyzed a reference case, plus 46 alternative cases,

and determined the nuclear power contribution for each. The EIA reported that in 2010, nuclear power produced 803×10^9 kilowatt-hours of electricity and projected that for the reference case, nuclear power would produce 874×10^9 kilowatt-hours in 2035 (EIA 2011a). Of the 46 alternative cases, the Greenhouse Gas (GHG) Price Economywide and Integrated High Technology cases had the largest and smallest projected nuclear power contributions in 2035, respectively. The GHG Price Economywide case was projected to contribute $1{,}052 \times 10^9$ kilowatt-hours in 2035, while the Integrated High Technology case was projected to contribute 823×10^9 kilowatt-hours. Figure 22 shows and compares the EIA projections.



Source: EIA 2011a

Figure 22: Nuclear-Generated Electricity Projections

It is assumed that the 2035 to 2009 U_3O_8 requirements would have the same ratio as the 2035 to 2010 EIA (2011a) nuclear power estimates. Thus, for the EIA Reference Nuclear, Low Nuclear Production (Integrated High Technology), and High Nuclear Production (GHG Price Economywide) cases, the total U_3O_8 requirements in 2035 are estimated to be 7,728, 7,277, and 9,302 thousand pounds, respectively. Costs were estimated for four cases, with each case assuming a different type of uranium recovery facility responsible for producing the required U_3O_8. The cases are (1) only conventional mills, (2) only ISL facilities, (3) only heap leach facilities, and (4) a mixture of all three types of facilities.

To divide the total U_3O_8 requirement among the three types of uranium recovery facilities for Case 4, it is assumed that one reference heap leach facility would be operational, and that the remainder of the U_3O_8 would be divided between conventional mills and ISL facilities with the same ratio as in 2009. The total amount of U.S.-origin U_3O_8 for each of the 2035 projections is shown in Table 25 for Case 4. For the remaining three cases, the total 2035 projections given in Table 25 were assumed to be produced by the particular mine type associated with the case.

Table 25: Assumed Case 4 U_3O_8 Production Breakdown by Mine Type

Mine Type	U_3O_8 Produced (1,000 lb)				
	2009	2035 Projections			
		Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
Conventional	3,356	3,159	2,947	3,903	4,642
In-Situ Leach	3,744	3,525	3,287	4,355	5,178
Heap Leach	—	1,043	1,043	1,043	1,043
Total	7,100	7,728	7,277	9,302	10,862

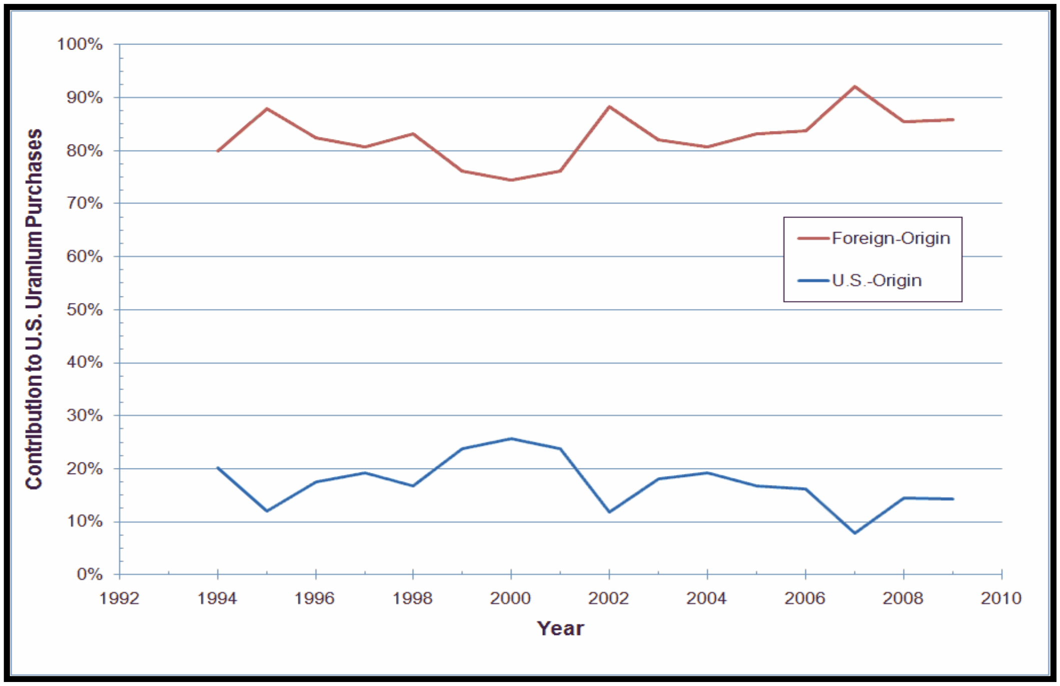
Source: EIA 2011b

The 2035 total cost and revenue estimates for uranium recovery facilities appear in Table 18 (page 75) and are based on the Table 25 U_3O_8 productions and the individual facility unit cost estimates given in Table 24. Refer to Section 6.2 for a discussion of the Table 18 total cost and revenue estimates. Table 26 gives a breakdown by facility type for Case 4, the mixed uranium recovery facility case.

Table 26: Case 4 (Mixed Uranium Recovery Facilities) Economic Projections (Nondiscounted)

Cost/Revenue	2035 Projections ($1,000)			
	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$502,305	$472,994	$604,605	$706,057
Conventional	$205,407	$191,551	$253,767	$301,726
In-Situ Leach	$229,108	$213,653	$283,048	$336,541
Heap Leach	$67,790	$67,790	$67,790	$67,790
U_3O_8 Cost	$391,584	$368,411	$472,461	$552,668
Conventional	$162,932	$151,941	$201,292	$239,334
In-Situ Leach	$180,590	$168,409	$223,108	$265,273
Heap Leach	$48,062	$48,062	$48,062	$48,062

The EIA (2010, Table S1a) shows that most of the U_3O_8 purchased in the United States is of foreign origin (see Figure 23). In 2009, the 7,100 thousand pounds of U_3O_8 produced in the United States amounted to only 14.2% of the total amount of U_3O_8 purchased. Since the total cost and revenue estimates in Table 18 (page 75) are based on the 2009 U.S.-produced U_3O_8, then those estimates include the assumption that 85.8% of the U.S.-purchased U_3O_8 is of foreign origin. As Figure 23 shows, the amount of foreign origin U_3O_8 has fluctuated over time. If all of the U_3O_8 that is purchased in the United States were to be supplied domestically, then the total cost and revenue estimates shown in Table 18 would increase by a factor of 7 (i.e., 1/0.142 = 7). However, this is considered to be unrealistic and is unsupported by the data shown in Figure 23. As an alternative, the Ref Low Import case shown in Table 18 assumes that 20% of the 2035 EIA Reference case U_3O_8 needs would be met domestically.



Source: EIA 2010, Table S1a

Figure 23: U.S. and Foreign Contribution to U_3O_8 Purchases

6.3 Economic Assessment of Proposed GACT Standards

EPA is proposing to revise Subpart W by introducing three categories related to how uranium recovery facilities manage byproduct materials during and after the processing of uranium ore. are presented and described in Section 5.4 presents and describes the proposed GACTs for each category. This section presents the costs and benefits associated with the implementation of the various components of the GACTs. The first category is the standards for conventional mill tailings impoundments. The second category consists of requirements for nonconventional impoundments where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids. Examples of this category are evaporation or holding ponds that exist at conventional mills and ISR and heap leach facilities. Requirements in this second category are that the nonconventional impoundments be provided with a double liner (Section 6.3.2) and that liquid at a depth of 1 meter be maintained in the impoundment (Section 6.3.3). The third category of revised Subpart W would require that heap leach piles be provided with a double liner (Section 6.3.4) and that the pile's moisture content be maintained above 30% by weight (Section 6.3.5). Additionally, the revised Subpart W would remove the requirement to monitor the radon flux at conventional facilities constructed on or prior to December 15, 1989 (Section 6.3.1).

6.3.1 Method 115, Radon Flux Monitoring

Existing Subpart W regulations require licensees to perform annual monitoring using Method 115 to demonstrate that the radon flux at conventional impoundments constructed before December 15, 1989, is below 20 pCi/(m^2-sec). The elimination of this monitoring requirement

would result in cost savings for the three facilities to which this requirement still applies: Sweetwater, White Mesa, and Shootaring Canyon.[9]

Radon Flux Monitoring Unit Costs

Method 115 requires that multiple large-area activated charcoal collectors (LAACCs) be employed to make radon flux measurements. The first step in preparing this cost estimate was to develop the cost for making a single LAACC radon flux measurement. Unit cost data for performing LAACC radon flux measurements were obtained from three primary sources: the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (EPA 2000a), KBC Engineers (KBC 2009), and Waste Control Specialists (WCS 2007). Weston Solutions provided fully loaded billing rates for radiation safety officers (RSOs) and certified health physicists (CHPs) (WS 2003).

MARSSIM (EPA 2000a)—MARSSIM is a multivolume document that presents methodologies for performing radiation surveys. Appendix H to MARSSIM describes field survey and laboratory analysis equipment, including the estimated cost per measurement. Included in Appendix H is the cost estimate for performing an LAACC measurement. The MARSSIM estimated cost range for LAACC radon flux measurements is $20 to $50 per measurement, including the cost of the canister. Since MARSSIM, Revision 1, was published in August 2000, it is assumed that this cost estimate is in 2000 dollars. MARSSIM does not estimate the cost for deploying the canisters or for final report preparation.

KBC Engineers (KBC 2009)—In November 2009, KBC Engineers prepared a revised "Surety Rebaselining Report" for the Kennecott Uranium Company's Sweetwater Uranium Project, which included an estimate for the cost of performing Method 115 radon flux monitoring. KBC based the canister testing cost of $50 per canister on past invoices received from Energy Laboratories, Inc. (a commercial analytical laboratory). In addition to the cost for the laboratory work, KBC included estimates for setting up and retrieving canisters in the field and for data analysis and report preparation. KBC estimated that a technician/engineer with a fully loaded billing rate of $100 per hour would require 40 hours to set up and retrieve 110 canisters, or $36.36 per canister. Also, KBC estimated that an engineer/scientist with a fully loaded billing rate of $105 per hour would require 20 hours for data analysis and report preparation for the 110 canisters, or $19.06 per canister. The KBC unit cost estimates are in 2009 dollars.

Waste Control Specialists (WCS 2007)—In its application to construct and operate a byproduct material disposal facility,[10] Waste Control Specialists, LLC (WCS) included a closure plan and corresponding cost estimate. As part of the final status survey, the radon flux through the disposal unit cap will be measured using LAACCs. WCS used the MARSSIM value as the cost for testing the canister. In addition, WCS included the cost of an RSO at $75 per hour to conduct the survey and prepare report and the cost of a CHP at $104 per hour to review the survey data. For the 100 canisters assumed, WCS assumed the RSO would require 40 hours for a cost of $30

[9] Cotter Corporation has indicated that the primary impoundments at its Cañon City site are no longer active, and thus, it has stopped performing Subpart W radon flux monitoring at that site (Thompson 2010).

[10] The WCS facility is not a conventional tailings facility or a uranium recovery facility. It was specially constructed to handle the K-65 residues that were stored at DOE's Fernald site.

per canister and the CHP would require 10 hours, or $10.40 per canister. The WCS unit costs are in 2004 dollars.

Weston Solutions (WS 2003)—Weston Solutions did not estimate the cost associated with Method 115 radon flux monitoring, but it did include the fully loaded hourly billing rates for radiation supervisors (equivalent to RSOs) and CHPs of $78 and $133, respectively. These billing rates are in 2003 dollars.

Unit Costs—Table 27 summarizes the data provided in the four source documents. The first step was to adjust all of the data to constant 2011 dollars. The CPI (DOL 2012) was used to make this adjustment. The right side of Table 27 shows the adjusted cost data.

Table 27: Data Used to Develop Method 115 Unit Costs

Data as Provided						Adjusted to November 2011 (CPI = 226.23)		
Source	Date	CPI	Cost per Canister			Cost per Canister		
			Testing	Setup/ RSO	Analysis/ CHP	Testing	Setup/ RSO	Analysis/ CHP
EPA 2000a	Aug-00	172.8	$20.00	N.G.	N.G.	$26.18	N.G.	N.G.
			$50.00	N.G.	N.G.	$65.46	N.G.	N.G.
WS 2003	Dec-03	184.3	N.G.	$31.20	$13.30	N.G.	$38.30	$16.33
WCS 2007	May-07	207.949	$25.00	$30.00	$10.40	$27.20	$32.64	$11.31
			$50.00			$54.40		
KBC 2009	Nov-09	216.33	$50.00	$36.36	$19.09	$52.29	$38.03	$19.96

N.G. = not given in the source document

Based on the data from Table 27, minimum, average, and maximum unit costs for performing Method 115 radon flux monitoring were estimated and are shown in Table 28.

Table 28: Method 115 Unit Costs

Type	LAACC Unit Cost ($/Canister)			
	Testing	Setup/RSO	Analysis/CHP	Total
Minimum	$26.18	$32.64	$11.31	$70.14
Average	$45.11	$36.32	$15.87	$97.29
Maximum	$65.46	$38.30	$19.96	$123.72

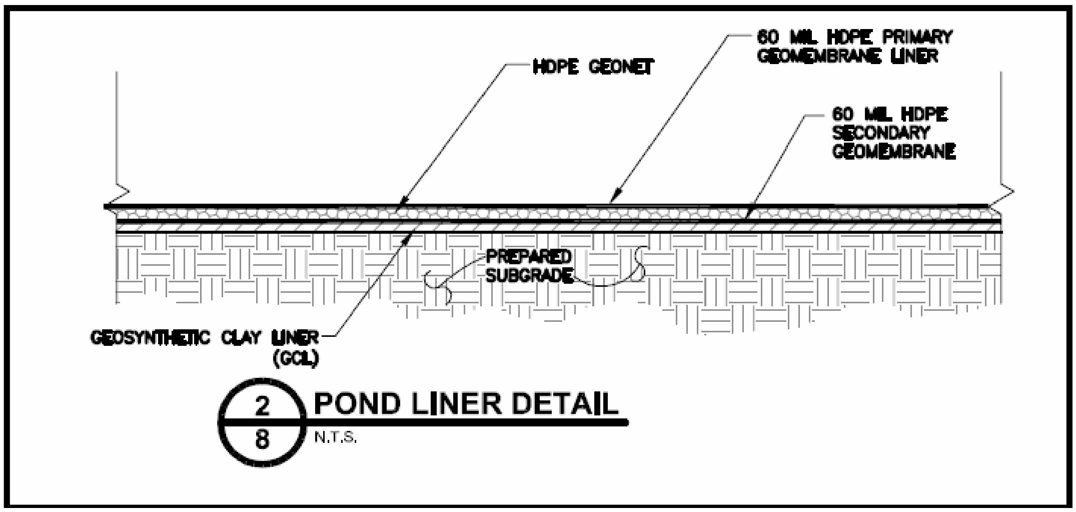
Total Annual Cost Savings (Benefit)

Method 115 requires 100 measurements per year as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. Additionally, if there are exposed beaches or soil-covered areas (as is likely at White Mesa), then an additional 100 measurements are necessary. Thus, for the three sites still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring (based on the Table 28 LAACC unit costs) is estimated to be about $9,730 per site per year for Shootaring and

Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 yr^{-1}, with a range from approximately $28,000 to $49,500 yr^{-1}.

6.3.2 Double Liners for Nonconventional Impoundments

Uranium byproduct materials are often stored in onsite impoundments at uranium recovery facilities, including in holding ponds and evaporation ponds. These ponds can be collectively referred to as nonconventional impoundments, to distinguish them from conventional tailings impoundments. This section provides an estimate of the cost to provide these nonconventional impoundments with a double liner, including a leak collection layer. Figure 24 shows a typical design of an impoundment double liner.



Source: Golder 2008, Drawing 8

Figure 24: Typical Double-Lined Impoundment with Leak Collection Layer

Double Liner Unit Costs

Unit costs, per square foot of liner, have been estimated for the three components of the double liner system: the geomembrane (HDPE) liner, the drainage (Geonet) layer, and the geosynthetic clay liner (GCL).

HDPE Unit Cost—The geomembrane (HDPE) liner installation unit cost estimates shown in Table 29 were obtained from the indicated documents and Internet sites. The Table 29 unit costs include all required labor, materials, and manufacturing quality assurance documentation costs (Cardinal 2000, VDEQ 2000). Where necessary, the unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 29 geomembrane (HDPE) liner mean unit cost is $0.95 ft^{-2}, the median cost is $0.74 ft^{-2}, while the minimum and maximum costs are $0.45 and $2.35, respectively.

Table 29: Geomembrane (HDPE) Liner Unit Costs

Data Source	Unit Cost (ft^{-2})		Thickness - Area
	As Given	2011$	
Foldager 2003	$0.37	$0.45	Not Specified
Vector 2006	$0.45	$0.50	60 mil
Cardinal 2000	$0.39	$0.51	60 mil - 470,800 SF
Cardinal 2000	$0.40	$0.52	60 mil - 138,920 SF
Earth Tech 2002	$0.45	$0.57	60 mil
Cardinal 2000	$0.47	$0.61	60 mil - 118,800 SF
VDEQ 2000	$0.48	$0.63	60 mil
Duffy 2005	$0.60	$0.70	40 mil
Get-a-Quote	$0.70	$0.70	40 mil
Cardinal 2000	$0.54	$0.71	60 mil - 60,600 SF
MWH 2008	$0.70	$0.74	40 mil
Project Navigator 2007	$0.70	$0.76	60 mil
MWH 2008	$0.80	$0.84	80 mil
Get-a-Quote	$0.86	$0.86	60 mil
EPA 2004	$0.80	$0.96	60 mil
Get-a-Quote	$1.04	$1.04	80 mil
Free Construction	$1.05	$1.05	40 mil
Free Construction	$1.69	$1.69	60 mil
Foldager 2003	$1.40	$1.72	Not Specified
Free Construction	$2.00	$2.00	80 mil
Lyntek 2011	$2.35	$2.35	80 mil

Drainage Layer (Geonet) Unit Cost—Some of the documents reviewed included unit cost estimates for installation of the drainage (Geonet) layer, as shown in Table 30. As with the geomembrane (HDPE) liner unit costs, the drainage (Geonet) layer unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 30 drainage layer (Geonet) mean unit cost is $0.64 ft^{-2}, the median cost is $0.57 ft^{-2}, while the minimum and maximum costs are $0.48 and $1.02, respectively.

Table 30: Drainage Layer (Geonet) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
EPA 2004	$0.40	$0.48
Project Navigator 2007	$0.45	$0.49
Earth Tech 2002	$0.45	$0.57
MWH 2008	$0.60	$0.63
Duffy 2005	$0.88	$1.02

Geosynthetic Clay Liner (GCL) Unit Cost—Some of the documents reviewed also included unit cost estimates for installation of the GCL, as shown in Table 31. As for the geomembrane (HDPE) liner unit costs, the CPI was used to adjust the GCL unit costs from the year they were estimated to year 2011 dollars. The Table 31 GCL mean unit cost is $0.69 ft^{-2}; the median cost is $0.65 ft^{-2}; and the minimum and maximum costs are $0.45 and $1.12, respectively.

Table 31: Geosynthetic Clay Liner (GCL) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
Vector 2006	$0.40	$0.45
EPA 2004	$0.40	$0.48
Earth Tech 2002	$0.52	$0.65
Project Navigator 2007	$0.70	$0.76
Lyntex 2011	$1.12	$1.12

Some designs may choose to use a compacted clay layer beneath the double liner (e.g., Figure 26). However, Sandia (1998) has found that "[r]eplacing the 60 cm thick clay (amended soil) barrier layer with a GCL drastically reduced the cost and difficulty of construction." This savings was due to avoiding the expense of obtaining the bentonite clay and the difficulties of the clay being "sticky to spread and slippery to drive on," plus "compaction was extremely difficult to achieve." For these reasons, it is believed that GCL will be used in most future applications and is thus appropriate for this cost estimate.

Design and Engineering—The cost estimates include a 20% allowance for design and engineering for the mean and median estimates, and a 10% and 20% allowance for the minimum and maximum estimates, respectively. The design and engineering cost has been calculated by multiplying the capital and installation cost by the allowance factor.

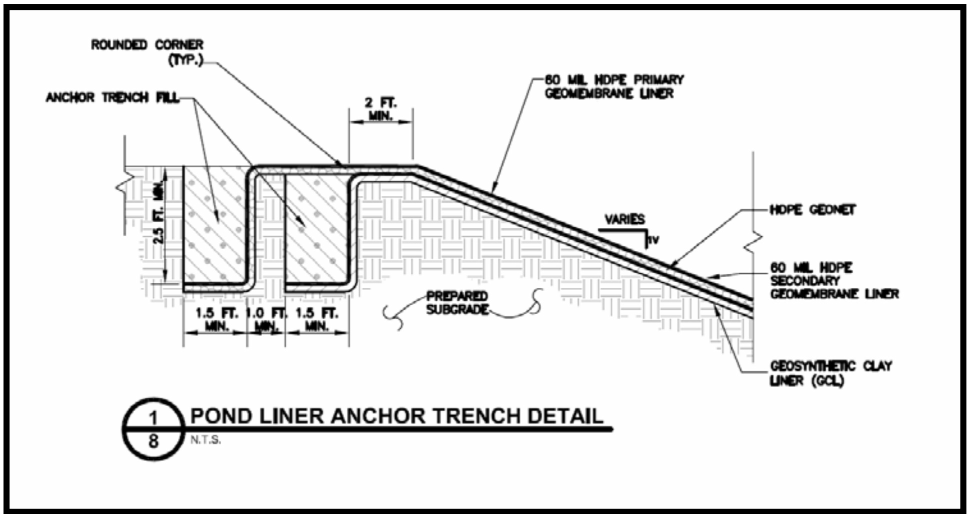
Contractor Oversight—The cost estimates include a 20% allowance for contractor oversight for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The contractor oversight cost has been calculated by multiplying the capital and installation cost by the allowance factor.

Overhead and Profit—The cost estimates include a 20% allowance for overhead and profit for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The overhead cost and profit has been calculated by multiplying the sum of the capital and installation, design and engineering, and contractor oversight costs by the allowance factor.

Contingency—The cost estimates include a contingency factor of 20% for the mean and median estimates, and 15% and 25% for the minimum and maximum estimates, respectively. The contingency has been calculated by multiplying the sum of all of the other costs by the contingency factor.

Double Liner Capital and Installation Cost

Impoundment Areas—Figure 25 shows that in order to anchor the upper liner and drainage layer (Geonet), an additional 8.5 ft of material is required on each side of the impoundment. Similarly, an additional 6 ft of material is required on each side of the impoundment to anchor the lower liner and the GCL.



Source: Golder 2008, Drawing 8

Figure 25: Typical Double Liner Anchor System

Section 6.2 describes base facilities for each type of uranium recovery facility: conventional, ISR, and heap leach. Since they are not given in Section 6.2, Table 32 shows the impoundment surface areas for each of the base facilities, plus the areas of the upper liner, drainage layer (Geonet), lower liner, and GCL. The liner areas include additional material in order to anchor the liner, plus an additional 10% to account for the sloping of the sides and waste.

Table 32: Nonconventional Impoundment Areas

Facility Type	Impoundment Type	Number	Area (acres)		
			Surface	Upper Liner & Geonet	Lower Liner & GCL
Conventional (Golder 2008)	Evaporation	10	4.13	4.94	4.82
	Total	10	41.30	49.39	48.22
ISR (Powertech 2009)	Water Storage	10	7.20	8.41	8.26
	Process Water	1	3.31	3.98	3.88
	Total	11	75.31	88.05	86.50
Heap (Titan 2011)	Raffinate	1	0.9	1.17	1.11
	Collection	1	1.5	1.88	1.81
	Evaporation	1	5.7	6.71	6.58
	Total	3	8.10	9.75	9.50

Impoundment Double Liner Cost—Based on the above estimated quantities of material and unit costs, Table 33 presents the median, minimum, and maximum capital costs for installing the

double liner beneath the impoundments of each of the three types of uranium recovery facilities: conventional, ISR, and heap leach.

Table 33: Base Facility Nonconventional Impoundment Double Liner Capital and Installation Costs

Cost Type	Conventional	ISR	Heap
Mean	$13,800,000	$24,700,000	$2,700,000
Median	$11,500,000	$20,600,000	$2,300,000
Minimum	$6,500,000	$11,600,000	$1,300,000
Maximum	$32,900,000	$58,900,000	$6,500,000
Mean, w/o Upper Liner	$6,800,000	$12,100,000	$1,300,000

To demonstrate the individual component contribution to the total capital and installation cost, Table 34 presents the calculated mean capital cost breakdown by category.

Table 34: Mean Base Facility Nonconventional Impoundment Double Liner Capital and Installation Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Impoundment Double Liner Capital and Installation Cost		
		Conventional	ISR	Heap
Upper Liner	$0.95	$2,040,654	$3,638,014	$402,799
Drainage (Geonet)	$0.64	$1,370,814	$2,443,844	$270,581
Lower Liner	$0.95	$1,992,191	$3,573,958	$392,414
GCL	$0.69	$1,455,818	$2,611,714	$286,761
Design & Engineering	20%	$1,371,895	$2,453,506	$270,511
Contractor Oversight	20%	$1,371,895	$2,453,506	$270,511
Overhead & Profit	20%	$1,920,654	$3,434,908	$378,715
Contingency	20%	$2,304,784	$4,121,890	$454,459
Total	—	$13,828,706	$24,731,338	$2,726,751

Table 33 includes capital and annual cost estimates for a mean, without upper liner case. This case was added because, even if not required to comply with 40 CFR 192.32(a)(1), the design of nonconventional impoundments at uranium recovery facilities would include at least a single liner. The reason is that the NRC, in 10 CFR 40, Appendix A, Criterion 5(A), requires that "… surface impoundments (…) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water … ." Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

Double Liner Total Annual Cost

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb.

Table 35 presents the calculated annualized cost for installation of a double liner in a nonconventional impoundment for the 2035 projected U_3O_8 productions. The annualized cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of each uranium recovery facility, and then multiplying by the projected amount of U_3O_8 produced annually. Table 35 presents four cases. In the first three cases, it was assumed that a single type of uranium recovery facility would produce all of the U_3O_8 required in 2035, while in the fourth case, it was assumed that a mixture of uranium recovery facilities would be operating in 2035. For the fourth case, Table 25 gives the contribution to the total U_3O_8 required in 2035 by each type of facility.

Table 35: Projected Nonconventional Impoundment Double Liner Annualized Capital and Installation Costs

Cost Type	Projected 2035 U_3O_8 Production	Annualized Capital and Installation Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$6,700,000	$22,700,000	$1,600,000	$14,800,000
Median	Reference Nuclear	$5,600,000	$18,900,000	$1,400,000	$12,400,000
Minimum	Low Nuclear Production	$2,900,000	$10,000,000	$700,000	$6,500,000
Maximum	Reference Low Import	$22,400,000	$76,100,000	$5,500,000	$49,300,000
Mean, w/o Upper Liner	Reference Nuclear	$3,300,000	$11,100,000	$800,000	$7,300,000

In addition to the annualized capital and installation costs, the total annual cost includes the costs associated with the operation and maintenance (O&M) of the double liner. For the double liner, O&M would consist of daily inspection of the liner and repair of the liner when rips or tears are observed above the water level or when water is detected in the leak detection layer. Since daily inspections of the nonconventional impoundments are part of the routine operation of the uranium recovery facility (Visus 2009), the only additional O&M cost associated with the double liner would be the repair costs. It was assumed that the annual O&M cost for the nonconventional impoundments would be 0.5% of the total capital cost for installing the liners (MWH 2008 and Poulson 2010). Using the Table 33 base facility cost estimates for installation of the double liner, Table 36 shows the calculated double liner O&M costs for each base facility.

Table 36: Base Facility Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	O&M Allowance	Base Facility Annual O&M Cost ($/yr)		
		Conventional	ISR	Heap
Mean	0.5%	$68,000	$120,000	$13,000
Median	0.5%	$56,000	$100,000	$11,000
Minimum	0.25%	$16,000	$29,000	$3,200
Maximum	1.0%	$330,000	$590,000	$65,000
Mean, w/o Upper Liner	0.5%	$34,000	$61,000	$6,700

Table 37 shows annual O&M costs for the projected 2035 U_3O_8 productions. The Table 37 annual O&M costs were calculated by dividing the Table 36 costs by each base facility's annual U_3O_8 production and then multiplying by the projected 2035 U_3O_8 production.

Table 37: Projected Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	Projected 2035 U_3O_8 Production	Annual Operation and Maintenance Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$1,300,000	$990,000	$50,000	$1,100,000
Median	Reference Nuclear	$1,100,000	$830,000	$39,000	$950,000
Minimum	Low Nuclear Production	$300,000	$230,000	$11,000	$250,000
Maximum	Reference Low Import	$9,000,000	$6,900,000	$330,000	$7,600,000
Mean, w/o Upper Liner	Reference Nuclear	$700,000	$500,000	$24,000	$560,000

The total annual cost for a double liner in a nonconventional impoundment is simply the sum of the annualized capital (Table 35) and installation cost plus the annual O&M cost (Table 37). Table 38 shows these total annual costs for the five cost types and four assumed uranium recovery facility cases.

Table 38: Projected Nonconventional Impoundment Double Liner Total Annual Costs

Cost Type	Projected 2035 U_3O_8 Production	Total Annual Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$8,000,000	$23,700,000	$1,700,000	$16,000,000
Median	Reference Nuclear	$6,700,000	$19,800,000	$1,400,000	$13,300,000
Minimum	Low Nuclear Production	$3,200,000	$10,200,000	$700,000	$6,800,000
Maximum	Reference Low Import	$31,400,000	$83,000,000	$5,800,000	$56,900,000
Mean, w/o Upper Liner	Reference Nuclear	$3,900,000	$11,700,000	$800,000	$7,800,000

Section 6.2, Table 18 (page 75), shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection. Table 39 compares those total U_3O_8 production costs to the double liner total costs given in Table 38. As Table 39 shows, the cost to install a double liner is less than 6% of the total cost to produce U_3O_8, while the cost to upgrade from a single liner to a double liner is less than 3% of the total cost.

Table 39: Comparison of Double Liner to Total U_3O_8 Production Costs

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)			Liner Contribution	
	Total Annual (Table 18)	Double Liner (Table 38)	Single to Double (Table 38)	Double Liner	Single to Double
Conventional	$398	$8.0	$3.9	2.0%	1.0%
In-Situ Leach	$411	$23.7	$11.7	5.8%	2.8%
Heap Leach	$356	$1.7	$0.8	0.5%	0.2%
Mixed Facilities	$396	$16.0	$7.8	4.0%	2.0%

Finally, the conventional, ISR, and heap leach base uranium recovery facilities (see Section 6.2) include a double liner, with drainage layer (Geonet) collection system for their onsite

impoundment designs. Thus, there is no additional cost for the Section 6.2 base uranium recovery facilities to meet the design and construction requirements at 40 CFR 192.32(a)(1) for onsite nonconventional impoundments.

Benefits from a Double Liner for a Nonconventional Impoundment

Including a double liner in the design of all onsite nonconventional impoundments that would contain uranium byproduct material would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, decision makers should consider this benefit because of the significance of ground water as a source of drinking water.

6.3.3 Maintaining 1 Meter of Water in Nonconventional Impoundments

As shown in Section 3.3.1, as long as a depth of approximately 1 meter of water is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine if there is any contribution above background radon values. This section estimates the cost to maintain 1 meter of water in the impoundment.

In order to maintain 1 meter, or any level, of water within a pond it is necessary to replace the water that is evaporated from the pond. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with makeup water supplied by the pond's operator. The replacement process is assumed to be required as part of the normal operation of the uranium recovery facility, which would occur regardless of the GACT. Thus, this cost estimate does not include process water replacement.

Unit Cost of Water

Three potential sources of pond makeup water were considered: municipal water suppliers, offsite non-drinking-water suppliers, and onsite water.

Municipal Water Supplier (Black & Veatch 2010)—In 2009/2010, a survey of the cost of water in the 50 largest U.S. cities was performed (Black & Veatch 2010). The survey compiled typical monthly bill data for three residential (3,750, 7,500, and 15,000 gallon/month), a commercial (100,000 gallon/month), and an industrial (10,000,000 gallon/month) water users. For this study, the commercial and industrial data were normalized to dollars per gallon, and the higher of the two values was used.

The survey found that the cost of water ranged from \$0.0012 gallon^{-1} in Sacramento, California, to \$0.0066 gallon^{-1} in Atlanta, Georgia, with a mean of \$0.0031 gallon^{-1} and a median of \$0.0030 gallon^{-1}. Looking at only those cities located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, and Texas; the survey included no cities in Utah or Wyoming), the survey found that the cost of water ranged from \$0.0016 gallon^{-1} in Albuquerque, New Mexico, to \$0.0045 gallon^{-1} in Austin, Texas, with a mean and median of \$0.0031 gallon^{-1}.

Offsite Non-Drinking-Water Suppliers (DOA 2004)—The water supplied by municipal water suppliers has been treated and is suitable for human consumption. It is not necessary for

impoundment evaporation makeup water to be drinking water grade. Therefore, using the data from the 50-city survey would likely overestimate the impoundment makeup water cost. Unfortunately, no data could be found as to the cost of non-drinking-water grade water for use as impoundment makeup water. However, another large scale use of non-drinking-water grade water is for crop irrigation, and the U.S. Department of Agriculture has compiled data on the cost of irrigation water for crops (DOA 2004).

For offsite sources of irrigation water, the Department of Agriculture states that the "31.6 million acre-feet of water received from off-farm water suppliers … cost irrigators $579 million, for an average cost of $18.29 per acre-foot of water …" (DOA 2004, page XXI), or $0.000056 gallon^{-1}.

Onsite Water (DOA 2004)—The Department of Agriculture identifies both wells (43.5 million acre-feet) and surface water (11.8 million acre-feet) as sources of onsite water. The cost for both sources is essentially the cost to pump the water from its source to where it is used. Unfortunately, the Department does not provide separate pumping costs for each onsite source, but instead states:

> *There were 497,443 irrigation pumps of all kinds used on 153,117 farms in 2003 irrigating 42.9 million acres of land. These pumps were powered by fuels and electricity costing irrigators a total of $1.55 billion or an average of $10,135 per farm. The principal energy source used was electricity, for which $953 million was spent to power 319,102 pumps that irrigated 24.1 million acres at an average cost of $39.50 per acre. Solar energy was reported as the source for pumping wells on 360 farms irrigating 16,430 acres.* [DOA 2004, page XXI]

From these data, it is possible to determine that the mean cost for pumping onsite water from both sources is $0.000086 gallon^{-1}. Also, on a per acre basis, the cost of using electricity to pump the water is slightly higher than the total average cost (i.e., $39.50 versus $36.13), and the use of solar energy to pump water is very rare (i.e., only about 0.03%).

Unit Costs—Table 40 shows the makeup water unit costs that have been estimated for this study. As described, the municipal water source costs are taken from Black & Veatch 2010, while the mean costs for offsite non-drinking and onsite water sources were taken from DOA 2004. All unit water costs were adjusted to 2011 dollars.

Although the Department of Agriculture did not present sufficient data to allow for the calculation of minimum, maximum, and median unit water costs, these costs were estimated by assuming that the cost of offsite non-drinking and onsite water sources have variation in costs similar to the variation in municipal supplier costs. Table 40 also shows these estimated makeup water unit costs.

Table 40: Makeup Water Unit Costs

Area	Source	Makeup Water Unit Costs ($gallon^{-1}$)			
		Minimum	Mean	Median	Maximum
United States	Municipal Supplier	$0.0013	$0.0033	$0.0032	$0.0069
	Offsite Non-Drinking	$0.000027	$0.000069	$0.000067	$0.000144
	Onsite Source	$0.000041	$0.00011	$0.00010	$0.00022
Potential Uranium Producing States (AZ, CO, NM, TX)	Municipal Supplier	$0.0017	$0.0032	$0.0033	$0.0047
	Offsite Non-Drinking	$0.000035	$0.000068	$0.000068	$0.000099
	Onsite Source	$0.000054	$0.00010	$0.00010	$0.00015

Additionally, Edge (2009) presents the discounted cost of estimated consumptive water use for the Piñon Ridge conventional mill. With 3% and 7% discount rates, the 40-year cost of water was presented as $58,545 and $33,766, respectively, which translates into an annual cost of $2,533. Edge (2009, page 7-2) indicates that the Piñon Ridge mill is estimated to use 227 acre-feet of water per year. This gives a water unit cost of $0.000034, which is consistent with the Table 40 offsite non-drinking and onsite water sources unit costs.

Total Annual Cost to Maintain 1 Meter of Water

Required Water Makeup Rate (Net Evaporation Rate)—As stated above, in order to maintain the water level within a nonconventional impoundment, it is necessary to replace the water that is evaporated from the impoundment. Some (and in some places all) of the evaporated water will be made up by naturally occurring precipitation. Figure 17 shows the annual evaporation (inches per year (in/yr)) of the lower 48 states, while Figure 16 shows the annual precipitation (in/yr). To determine the annual required water makeup rate, the Figure 16 data is simply subtracted from the Figure 17 data. A positive result indicates that evaporation is greater than precipitation, and makeup water must be supplied, whereas a negative result indicates that precipitation is sufficient to maintain the impoundment's water level.

The U.S. Army Corps of Engineers (ACE) has published net lake evaporation rates for 152 sites located in the United States (ACE 1979, Exhibit I). The ACE found that the net evaporation ranged from -35.6 in/yr in North Head, Washington, to 96.5 in/yr in Yuma, Arizona, with a mean of 10.8 in/yr and a median of 0.9 in/yr. At 82 sites, the evaporation rate exceeds the precipitation rate, and makeup water would be required to maintain the impoundment's water level.

Looking at only those 22 sites located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, Texas, Utah, and Wyoming), the ACE found that the net evaporation rate ranged from 6.1 in/yr in Houston, Texas, to 96.5 in/yr in Yuma, Arizona, with a mean of 45.7 in/yr and a median of 41.3 in/yr. The evaporation rate exceeded the precipitation rate at all 22 sites in the potentially uranium-producing states included in the ACE study.

Uranium Recovery Facility Pond Size—As described in Section 6.2, a base facility was assumed for each of the three types of uranium recovery facilities. Table 41 gives information for each base facility that is necessary to calculate the annual makeup water cost (i.e., the surface area of the onsite impoundments and the annul U_3O_8 production).

Table 41: Summary of Base Facility Characteristics

Parameter		Conventional	ISR	Heap
Impoundment Surface Area	(acres)	41.3	75.3	8.1
U_3O_8 Production	(lb/yr)	400,000	930,000	2,200,000

Total Annual Cost—The only cost associated with maintaining the water level within the impoundment is the cost of the water. It is assumed that existing piping will connect the nonconventional impoundment to the water source, and that the water level will be visually checked at least once per day (Visus 2009).

The makeup water unit cost data from Table 40, the net evaporation rates from above (page 102), and the impoundment areas from Table 41 are combined to calculate annual makeup water cost estimates provided in Table 42.

Table 42: Base Facility Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)		
			Conventional	ISR	Heap
Mean	$0.00010	45.7	$5,313	$9,687	$1,042
Median	$0.00010	41.3	$4,840	$8,826	$949
Minimum	$0.000035	6.1	$240	$438	$47
Maximum	$0.00015	96.5	$16,337	$29,790	$3,204

The annual cost of makeup water from Table 42 was divided by the base facility U_3O_8 annual production rate from Table 41 to calculate the makeup water cost per pound of U_3O_8 produced, shown in Table 43.

Table 43: Base Facility Makeup Water Cost per Pound of U_3O_8

Cost Type	Makeup Water Cost ($/lb)		
	Conventional	ISR	Heap
Mean	$0.0133	$0.0104	$0.00047
Median	$0.0121	$0.0095	$0.00043
Minimum	$0.00060	$0.00047	$0.000021
Maximum	$0.041	$0.032	$0.0015

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb. Table 44 shows the makeup water costs which were calculated for the U_3O_8 production projected for 2035. The first three cost estimates assume that a single type of uranium recovery facility would be responsible for producing all of the projected U_3O_8, while the last estimates assume that a mix of uranium recovery type facilities is used, as described in Section 6.2.6.

Table 44: Projected Annual Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$102,630	$80,489	$3,660	$88,979
Median	Reference Nuclear	$93,500	$73,329	$3,334	$81,063
Minimum	Low Nuclear Production	$4,366	$3,424	$156	$3,780
Maximum	Reference Low Import	$443,678	$347,963	$15,821	$381,053

Table 18 (page 75) shows the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projections. Table 45 compares those total U_3O_8 production costs to the costs for maintaining 1 meter of water in the impoundments given in Table 44. As Table 45 shows, the cost to maintain 1 meter of water in the impoundments is much less than 1% of the total cost to produce U_3O_8 for all four cases analyzed.

Table 45: Comparison of Cost to Maintain 1 Meter of Water in the Impoundments to Total U_3O_8 Production Cost

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)		1 Meter Water Contribution
	Total Annual (Table 18)	1 Meter Water (Table 44)	
Conventional	$398	$0.103	0.026%
In-Situ Leach	$411	$0.080	0.019%
Heap Leach	$356	$0.004	0.001%
Mixed Facilities	$396	$0.089	0.022%

Total Annual Benefits from Maintaining 1 Meter of Water

By requiring a minimum of 1 meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)} \qquad (6\text{-}1)$$

Where:
- A = Radon attenuation factor (unitless)
- λ = Radon-222 decay constant (sec^{-1})
  = 2.1×10^{-6} sec^{-1}
- D = Radon diffusion coefficient (cm^2/sec)
  = 0.003 cm^2/sec in water
- d = Depth of water (cm)
  = 100 cm

Solving the above equation shows that 1 meter of water has a radon attenuation factor of about 0.07. To demonstrate the impact that a 1-meter water cover would have, the doses and risks reported in Section 4.4, Table 13 (page 49), have been recalculated. In this recalculation, it was assumed that an additional 1 meter of water covered all of the radon sources. Table 46 shows the results of this recalculation, in terms of the dose and risk reduction attributable to covering the

source area with 1 meter of water. Table 46 shows both the original radon release (as reported in Table 13, page 49) and the radon release after the source area has been covered with 1 meter of water.

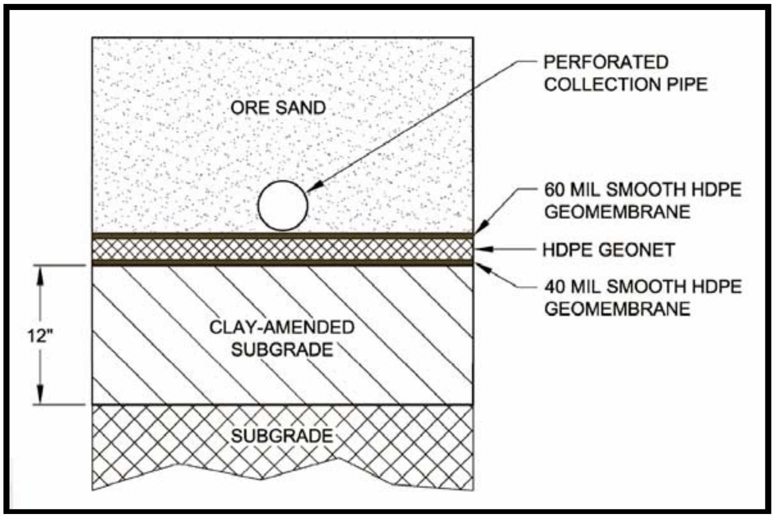
Table 46: Annual Dose and Risk Reduction from Maintaining 1 Meter of Water in the Impoundments

Uranium Site	Radon Release (Ci/yr)		Annual Dose Reduction		LCF[(a)] Risk Reduction (yr^{-1})	
	Table 13	1 Meter Water	Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	147	0.5	1.1	2.7E-06	5.6E-07
White Mesa	1,750	124	4.8	11.1	3.2E-05	5.9E-06
Smith Ranch - Highlands	36,500	2,590	3.4	1.4	2.1E-05	7.2E-07
Crow Butte	8,885	630	2.5	3.1	1.6E-05	1.6E-06
Christensen/Irigaray	1,600	114	3.5	1.8	2.2E-05	9.2E-07
Alta Mesa	740	52	20.1	10.7	1.2E-04	5.7E-06
Kingsville Dome	6,958	494	53.9	10.5	3.5E-04	5.7E-06

* LCF = latent cancer fatalities

6.3.4 Liners for Heap Leach Piles

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap piles. Figure 26 shows a typical design of a heap leach pile double liner. Although Figure 26 shows a clay-amended layer beneath the double liner, for the reasons given in Section 6.3.2, this cost estimate has assumed that a GCL would be used beneath the double liner, as shown in Figure 24.



Source: Titan 2011

Figure 26: Typical Heap Pile Liner

Double Liner Unit Costs

The unit costs for installing a double liner, with a leakage collection system, to a heap leach pile are assumed to be the same as the units costs developed in Section 6.3.2 for nonconventional impoundments.

The base heap leach facility utilizes a conveyor to deliver crushed material to the pile (Titan 2011). However, if material is delivered to the pile by truck, then the truck would put additional stress on the liner. Additional costs would be incurred to protect the liner from the additional stress. Because this analysis uses a range of liner unit costs, the additional costs for protecting the liner if truck loading is employed have been enveloped.

Total Cost of Heap Leach Pile Double Liner

Section 6.2.2 base heap leach facility (i.e., Sheep Mountain in Wyoming) includes two 80-acre heap piles. Using the same method described for the nonconventional impoundment (page 96), it was estimated that 90.3 acres of material would be required for the upper liner and drainage (Geonet) layer, and 89.6 acres of material for the lower liner and GCL. With these quantities of material and the unit costs from Section 6.3.2, Table 47 presents the median, minimum, and maximum capital and installation costs for installing the double liner beneath the two 80-acre heap piles.

Table 47: Heap Pile Double Liner Capital and Installation Costs

Cost Type	Capital and Installation Cost
Mean	$25,200,000
Median	$20,600,000
Minimum	$11,900,000
Maximum	$60,700,000
Mean, w/o Upper Liner	$12,900,000

Table 47 includes capital and annual cost estimates for a Mean, w/o Upper Liner case. This case was added because even if not required to meet the requirements at 40 CFR 192.32(a)(1), the design of the heap leach pile would include at least a single liner to collect the lixiviant flowing out of the heap. The reason is that since the lixiviant flowing out of the heap contains the uranium, it is in the licensee's economic interest to recover as much of it as possible, and since the rinsing liquid would be mixed with the lixiviant, it too would be recovered. Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

To demonstrate the individual component contribution to the total capital and installation cost, Table 48 presents a breakdown by component of the calculated mean capital and installation cost.

Table 48: Mean Heap Pile Double Liner Capital Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Heap Pile Double Liner Capital Cost
Upper Liner	$0.95	$3,730,077
Drainage (Geonet)	$0.64	$2,505,687
Lower Liner	$0.95	$3,702,230
GCL	$0.66	$2,579,315
Design & Engineering	20%	$2,503,462
Contractor Oversight	20%	$2,503,462
Overhead & Profit	20%	$3,504,847
Contingency	20%	$4,205,816
Total	—	$25,234,896

Table 49 presents the heap pile double liner annual cost estimates. The total annual cost is the sum of the annualized capital and installation cost and the annual O&M cost. The annualized capital cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of the heap leach facility, and then multiplying by the amount of U_3O_8 produced annually. The U_3O_8 annual production was based on 2035 projections made in Section 6.2.6.

Table 49 presents two cases. In the first case, it was assumed that all of the U_3O_8 required in 2035 would be produced by heap leach facilities, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 49: Heap Pile Double Liner Annual Costs

Case	Cost Type	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost
Heap Only	Mean	$15,100,000	$220,000	$15,300,000
	Median	$12,300,000	$180,000	$12,500,000
	Minimum	$6,700,000	$60,000	$6,800,000
	Maximum	$51,100,000	$1,340,000	$52,400,000
	Mean, w/o Upper Liner	$7,700,000	$110,000	$7,800,000
Mix	Mean	$340,000	$5,000	$350,000
	Median	$280,000	$4,000	$280,000
	Minimum	$160,000	$1,000	$160,000
	Maximum	$1,600,000	$43,000	$1,600,000
	Mean, w/o Upper Liner	$170,000	$3,000	$170,000

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for installing a double liner under the heap leach pile is about 4% of the total cost of heap leach U_3O_8 production (i.e., $15.3 million/$356 million), while the cost to change from a single liner to a double liner is about 2% of the total cost of heap leach U_3O_8 production (i.e., $7.8 million/$356 million).

Finally, the Section 6.2.2 base heap leach facility design includes a double liner, with drainage layer (Geonet) collection system, as shown in Figure 26. Thus, there is no additional cost for the Section 6.2.2 base heap leach facility to meet the design and construction requirements at 40 CFR 192.32(a)(1).

Benefits from a Double-Lined Heap Leach Pile

Including a double liner in the design of all heap leach piles would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, it is important for decision makers to consider this benefit because of the significance of ground water as a source of drinking water.

6.3.5 Maintaining Heap Leach Piles at 30% Moisture

As described in Section 5.4, the goal of this GACT is to maintain 30% moisture content in the heap leach pile so that the radon flux will be no larger than the flux from dry ore.

Simply adding water to the surface of the heap leach pile will replenish and maintain the moisture content in the surface layer. The moisture content in the remainder of the heap leach

vertical profile will be a function of the ore materials ability to retain moisture. The field moisture capacity of any earthen material is a function of the grain size and the mineralogy of the materials. Accordingly, the 30% moisture content should be attained with all low grade ore materials, due to the presence of significant fine-grained materials. Furthermore, it may not be necessary to maintain the entire pile at 30% moisture content, but only the upper portion of the pile. The exact depth to which the 30% moisture content requirement would apply would be determined on a site by site basis. The cost to supply the water to replenish the pile's moisture content has been estimated below.

It is also recognized that imposing a 30% moisture content requirement on the pile might (and likely, would) require certain design changes to the pile. Principal concerns to be addressed during pile design are slope stability and the liquefaction potential. Regarding slope stability, many leach piles are provided with containment dikes which provide structural support to the pile. The 30% moisture content requirement will have little or no effect on the moisture associated with the containment dikes, and thus the dikes would continue to provide support. Additionally, the pile design may be altered to increase its stability. For example, lower slopes, higher confinement dikes, the construction of stair-step pad grade, or the installation of textured (as opposed to smooth) geomembrane liner in critical areas would enhance pile stability.

Regarding liquefaction potential, it has been estimated that liquefaction is unlikely if the degree of saturation in the pile is less than about 85% (Sassa 1985, as referred to in Smith 2002, Thiel and Smith 2004). Assuming a 2.7 ratio between moisture content and saturation (NRC 1984), the 30% moisture content require translates into 81% saturation, which is slightly below the level required for liquefaction. Needless to say, with the increase in the saturation that will result from the imposition of the 30% moisture content requirement, more attention will need to be paid to the pile design to minimize the liquefaction potential.

The costs associated with these design changes have not been included in the following cost estimate because any design change would depend very much on the site's characteristics, and in many cases the design change might be inexpensive to implement if it is identified during the design phase. For example, using a textured rather than smooth liner, constructing higher containment dikes, and using stair-step pad grade could all be incorporated into the pile's design at minimal, if any, additional cost.

Unit Water Cost

The unit costs for providing water to a heap leach pile are assumed to be the same as the unit costs developed in Section 6.3.3 (page 100) for providing water to nonconventional impoundments.

Cost of Soil Moisture Meters

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors (Irrometer 2010). The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft) (Ben Meadows 2012).

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair (Spectrum 2011, Spectrum 2012).

Total Annual Cost to Maintain 30% Moisture in the Heap Leach Pile

The only cost associated with maintaining the moisture level within the pile is the cost of the water. It is assumed that existing piping (used to supply lixiviant to the pile during leaching) would be used to supply water necessary for maintaining the moisture level. Also, it is assumed that the in-soil method for moisture monitoring would be used, and that the above costs are insignificant. Finally, it is assumed that moisture readings would be performed during the daily inspections of the heap pile (Visus 2009), with no additional workhours.

The base heap leach facility includes a heap pile that will occupy up to 80 acres at a height of up to 50 ft. With an assumed porosity of 0.39 (see Section 5.1.5, page 56) and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 50 presents the calculated cost for makeup water to maintain the moisture level in the heap pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates derived in Section 6.3.3 were used for this estimate.

Table 50: Heap Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of makeup water in perspective, during leaching and rinsing of the pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2) (Titan 2011), or about 4,220 in/yr. This application rate is almost two orders of magnitude larger than the mean net evaporation rate, and is over a factor of 40 larger than the maximum net evaporation rate, shown in Table 50, and should be sufficient to maintain the moisture content within the pile

Section 6.2.6 and Table 25 (page 89) present projections of the U_3O_8 production for the year 2035. Table 51 presents the annual cost for makeup water to maintain the heap pile's moisture content. Table 51 presents two cases. In the first case, Heap Only, it was assumed that heap leach facilities would produce all of the U_3O_8 required in 2035, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 51: Projected Annual Heap Pile Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)	
		Heap Only	Mix
Mean	Reference Nuclear	$15,000	$300
Median	Reference Nuclear	$14,000	$300
Minimum	Low Nuclear Production	$650	$20
Maximum	Reference Low Import	$66,000	$2,100

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for maintaining 30% moisture in the heap leach pile is well under 1% of the total cost of heap leach U_3O_8 production (i.e., $15,000/$356,000,000).

Total Annual Benefits from Maintaining 30% Moisture in the Heap Leach Pile

By requiring a minimum 30% by weight moisture content in the heap leach pile, the release of radon from these piles would be reduced by up to about a factor of 2½, as shown in Figure 15. From the base case production profile (BRS 2011, page 86), it can be determined that the heap pile ore has a mean U-238 concentration of 213 pCi/g, and a range of 135 to 321 pCi/g. Assuming the normalized radon flux from a heap pile with 30% moisture content is 1 pCi/(m^2-sec) per pCi/g Ra-226, and that the Ra-226 is in equilibrium with the U-238, then the mean annual radon release from the 80-acre heap pile would be 2,180 Ci/yr. A comparable annual radon release from a dryer heap pile could be as high as 5,450 Ci/yr. Table 52 shows a comparison of annual doses and risks using these heap pile annual radon releases and the release to dose/risk relationship for the Western Generic site from Table 13.

Table 52: Annual Dose and Risk Comparison for Maintaining 30% Moisture Content in the Heap Pile

Heap Pile Moisture Content (by Weight)	Radon Release (Ci/yr)	Annual Dose		LCF[(a)] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
>30%	2,180	6.3	7.5	3.4E-04	9.6E-06
<30%	5,450	16	19	8.4E-04	2.4E-05

* LCF = latent cancer fatalities

Of course the exact reduction will depend upon the specific heap pile. For example, if a heap pile is operating at 20% moisture content without the GACT, then according to Figure 15, imposing the GACT would result in a radon flux reduction of about a factor of 1.6. Also, as Figure 14 shows, the response of the radon emanation coefficient to increasing moisture is very dependent on the material. This relationship between the emanation coefficient, moisture content, and material also influences the amount of reduction provided by the GACT.

6.3.6 Summary of Proposed GACT Standards Economic Assessment

Sections 6.3.2 through 6.3.5 presents the details of the economic assessment that was performed for implementing each of the four proposed GACT standards. **Table 53** presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, **Table 53** presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of **Table 53**.

Table 53: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost ($/lb U_3O_8)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	—	—	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the **Table 53**, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

Included in the Section 6.2 descriptions is the operational duration and amount of uranium produced by each reference facility. This information from Section 6.2 has been used to calculate an annual U_3O_8 production rate for each type facility, which in turn has been coupled with the unit costs provided in **Table 53**, to generate the annual cost for implementing each GACT at each reference facility. These annual costs are presented in **Table 54**. Again for comparison the baseline cost (without the GACTs) is provided at the bottom of **Table 54** for each type facility.

Table 54: Proposed GACT Standards Reference Facility Annual Costs

	Reference Facility Annual Cost ($/yr)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$410,000	$2,900,000	$230,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$5,300	$9,700	$1,100
GACT – Liners for Heap Leach Piles	—	—	$2,100,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4,500
GACTs – Total for All Four	$420,000	$2,900,000	$2,300,000
Baseline Facility Costs	$21,000,000	$49,000,000	$48,000,000

Based on EIA (EIA 2011a) nuclear power productions, Section 6.2.6 estimated the U.S. U_3O_8 productions until the year 2035. Using those EIA-based production estimates for 2011 and 2035 and the unit cost values from **Table 53**, **Table 55** presents the estimated national annual cost for implementing the proposed GACTs.

Table 55: Proposed GACT Standards National Annual Costs

	National Annual Cost ($1,000/yr)			
	2011 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,500	$12,000	$0	$15,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$45	$40	$0	$85
GACT – Liners for Heap Leach Piles	—	—	$0	$0
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0	$0
GACTs – Total for All Four	$3,600	$12,000	$0	$15,000
Baseline Facility Costs	$180,000	$200,000	$0	$380,000
	2035 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,300	$11,000	$230	$14,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$42	$37	$1.1	$80
GACT – Liners for Heap Leach Piles	—	—	$2,100	$2,100
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4.5	$4.5
GACTs – Total for All Four	$3,300	$11,000	$2,300	$17,000
Baseline Facility Costs	$160,000	$190,000	$48,000	$400,000

Since no facilities were operating, it was assumed that all 2011 U_3O_8 production was divided between conventional and ISL facilities with the 2009 ratio, as shown in Table 25 (i.e., 47.3% conventional and 52.7% ISL). As described in Section 6.2.6, for 2035 it was assumed that one

heap leach facility would be operational, and that the remainder of the U_3O_8 production would be divided between conventional and ISL facilities with the 2009 ratio.

Of course, if the amount of U_3O_8 produced by each type facility changes the annual cost to implement the GACTs changes as well. For example if in 2035 all U_3O_8 is produced by ISL facilities, then the national annual cost to implement the GACTs would increase from $17 million (as shown in **Table 55**) to $24 million. Alternatively, if all 2035 U_3O_8 is produced by conventional facilities, then the national annual cost to implement the GACTs would decrease to $8.1 million. Because the baseline U_3O_8 production costs are fairly constant across all three types of uranium recovery facilities (see **Table 53** and Sections 6.2.1 through 6.2.4), the 2035 baseline U_3O_8 production national annual cost would remain fairly constant around $400 million, regardless of how the U_3O_8 is produced.

Table 56 presents the national cost for the implementation of the four proposed GACTs summed over the years 2011 to 2035. As with the **Table 55** annual national costs, the **Table 56** summed national costs are based on EIA (EIA 2011a) nuclear power productions, as described in Section 6.2.6.

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Non-Discounted			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$81,000	$270,000	$5,800	$350,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$1,000	$910	$27	$2,000
GACT – Liners for Heap Leach Piles	—	—	$52,000	$52,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$110	$110
GACTs – Total for All Four	$82,000	$270,000	$58,000	$410,000
Baseline Facility Costs	$4,000,000	$4,600,000	$1,200,000	$9,800,000
	Discounted @3%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$58,000	$190,000	$4,100	$250,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$740	$650	$19	$1,400
GACT – Liners for Heap Leach Piles	—	—	$37,000	$37,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$80	$80
GACTs – Total for All Four	$59,000	$190,000	$41,000	$290,000
Baseline Facility Costs	$2,900,000	$3,300,000	$850,000	$7,000,000

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Discounted @ 7%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$40,000	$130,000	$2,900	$170,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$510	$450	$13	$970
GACT – Liners for Heap Leach Piles	—	—	$26,000	$26,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$55	$55
GACTs – Total for All Four	$41,000	$130,000	$29,000	$200,000
Baseline Facility Costs	$2,000,000	$2,300,000	$590,000	$4,800,000

As with the **Table 55** annual national costs, if the amount of U_3O_8 assumed to be produced by each type facility changes the **Table 56** summed national costs to implement the GACTs changes as well. For example if all U_3O_8 is produced by ISL facilities, then the non-discounted summed national cost to implement the GACTs would increase from $410 million (as shown in **Table 56**) to $590 million. Alternatively, if all U_3O_8 is produced by conventional facilities, then the non-discounted summed national cost to implement the GACTs would decrease to $200 million. Similar to the baseline annual national costs, the baseline U_3O_8 production non-discounted summed national cost would remain around $9.8 billion, regardless of how the U_3O_8 is produced.

6.4 Environmental Justice

Concerning environmental justice, EPA's economic assessment guidelines state:

> *Distributional analyses address the impact of a regulation on various subpopulations. Minority, low-income and tribal populations may be of particular concern and are typically addressed in an environmental justice (EJ) analysis. Children and other groups may also be of concern and warrant special attention in a regulatory impact analysis.* [EPA 2010, Section 10]

6.4.1 Racial Profile for Uranium Recovery Facility Areas

This section presents information on the racial (e.g., tribal populations) and economic (e.g., low income) profiles of the areas surrounding existing and proposed uranium recovery facilities.

Table 57 presents the racial profiles in the immediate areas (i.e., counties) surrounding the existing and proposed uranium recovery facilities, while Table 58 presents the profiles in the surrounding regional area (i.e., states) and on a national basis. A comparison of Table 57 to Table 58 indicates whether the racial population profile surrounding the uranium recovery facilities conform to the national and/or regional norms.

Table 57: Racial Profile for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	White	Black	Native American	Others
Juan Tafoya	Conventional	McKinley, NM	22.2%	0.4%	75.4%	2.0%
White Mesa Mill	Conventional	San Juan, UT	42.7%	0.1%	55.8%	1.3%
Grants Ridge	Heap Leach	Cibola, NM	56.2%	1.0%	40.9%	1.8%
Sheep Mountain	Heap Leach	Fremont, WY	78.3%	0.1%	19.8%	1.8%
Crow Butte	In-Situ Leach	Dawes, NE	94.5%	0.9%	3.0%	1.6%
Piñon Ridge	Conventional	Montrose, CO	96.6%	0.4%	1.4%	1.7%
Sweetwater Mill	Conventional	Sweetwater, WY	96.3%	0.8%	1.1%	1.9%
Christensen / Irigaray	In-Situ Leach	Campbell, WY	97.4%	0.2%	1.0%	1.4%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	97.5%	0.1%	1.0%	1.4%
Shootaring Canyon	Conventional	Garfield, CO	97.2%	0.5%	0.8%	1.6%
Kingsville Dome	In-Situ Leach	Kleberg, TX	92.8%	3.9%	0.8%	2.6%
Goliad	In-Situ Leach	Goliad, TX	93.6%	5.0%	0.7%	0.7%
Palangana	In-Situ Leach	Duval, TX	98.3%	0.6%	0.7%	0.4%
Alta Mesa	In-Situ Leach	Brooks, TX	98.8%	0.4%	0.6%	0.3%

Source: http://www.census.gov/popest/counties/asrh/

Table 58: Regional and National Racial Profiles

State		White	Black	Native American	Others
New Mexico	NM	85.4%	2.1%	9.8%	2.7%
Wyoming	WY	95.1%	0.8%	2.3%	1.8%
Utah	UT	94.0%	0.9%	1.4%	3.7%
Colorado	CO	90.7%	4.0%	1.2%	4.1%
Nebraska	NE	92.7%	4.1%	0.9%	2.3%
Texas	TX	83.7%	11.8%	0.7%	3.9%
United States	US	81.1%	12.7%	0.9%	5.3%

Source: http://www.census.gov/popest/counties/asrh/

At 10 of the 15 sites, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is White exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either Black or Other is less than the national norm, while the percentage of Blacks and Others is less than the regional norm at all but one site.

For all of the sites considered together, the data in Table 57 do not reveal a disproportionately high incidence of minority populations being located near uranium recovery facilities. However, certain individual sites may be located in areas with high minority populations. Those sites would need to be evaluated during their individual licensing processes.

6.4.2 Socioeconomic Data for Uranium Recovery Facility Areas

Table 59 shows the socioeconomic data for the immediate areas (i.e., counties) surrounding the existing and planned uranium recovery facilities. Specifically, the socioeconomic data shown in Table 59 is the fraction of land that is farmed, the value of that farmland, and the nonfarm per capita wealth. The percentages shown next to the value of that farmland and the nonfarm per capita wealth indicate where the site ranks when compared to all other counties in the United States.

Table 59: Socioeconomic Data for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	Farm Land	Farm Value Per Hectare		Per Capita Nonfarm Wealth	
White Mesa Mill	Conventional	San Juan, UT	31.1%	$670	4.0%	$103,073	0.6%
Juan Tafoya	Conventional	McKinley, NM	90.9%	$185	0.0%	$115,603	1.9%
Alta Mesa	In-Situ Leach	Brooks, TX	72.8%	$1,423	13.2%	$117,693	2.2%
Grants Ridge	Heap Leach	Cibola, NM	58.2%	$378	0.7%	$118,862	2.4%
Palangana	In-Situ Leach	Duval, TX	74.1%	$1,792	17.5%	$132,493	6.9%
Crow Butte	In-Situ Leach	Dawes, NE	88.0%	$895	6.9%	$144,291	15.1%
Kingsville Dome	In-Situ Leach	Kleberg, TX	0.0%	$1,478	13.9%	$149,865	20.4%
Goliad	In-Situ Leach	Goliad, TX	92.6%	$2,244	22.0%	$162,584	35.4%
Piñon Ridge	Conventional	Montrose, CO	23.3%	$2,916	30.1%	$181,133	59.5%
Sheep Mountain	Heap Leach	Fremont, WY	42.6%	$768	5.3%	$186,775	65.4%
Shootaring Canyon	Conventional	Garfield, CO	21.4%	$3,195	34.3%	$200,316	76.7%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	92.5%	$381	0.7%	$208,583	82.1%
Christensen/Irigaray	In-Situ Leach	Campbell, WY	97.3%	$437	1.1%	$225,858	89.3%
Sweetwater Mill	Conventional	Sweetwater, WY	22.2%	$242	0.1%	$232,504	91.2%

The discussion first focuses on the per capita nonfarm wealth. For comparison, the per capita nonfarm wealth in the United States ranges from $39,475 (Slope County, North Dakota) to $618,954 (New York County, New York). Table 59 shows that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are very well to do (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the 50th percentile in the United States. On the other hand, five sites are located in areas in which the per capita nonfarm wealth is below the country's 10th percentile.

Table 59 shows that eight of the sites have more than 50% of their land devoted to farming. However, the Table 59 farm value data show that the farmland for all 15 sites is below the 35th percentile farmland value in the United States. This could indicate that the farmland is of poor quality, or simply that the land is located in an economically depressed area. For comparison, farmland in the United States ranges in value from $185 per hectare (McKinley County, New Mexico, which is the location of the proposed Juan Tafoya uranium recovery facility) to $244,521 per hectare (Richmond County, New York).

For all of the sites combined, the data provided in Table 59 do not reveal a disproportionately high incidence of low-income populations being located near uranium recovery facilities. However, certain individual sites may be located within areas of low-income population. Those sites would need to be evaluated during their individual licensing processes.

6.5 Regulatory Flexibility Act

The Regulatory Flexibility Act requires federal departments and agencies to evaluate if and/or how their regulations impact small business entities. Specifically, the agency must determine if a regulation is expected to have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

If a rulemaking is determined to have a significant economic impact on a substantial number of small entities, then the agency must conduct a formal regulatory flexibility analysis. However, if the agency determines that a rulemaking does not have a significant economic impact on a substantial number of small entities, then it makes a certification of that finding and presents the analyses that it made to arrive at that conclusion.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with 40 CFR 192.32(a)(1) (see Section 5.4). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the agency is proposing to eliminate the distinction made in the 1989 rule between impoundments constructed pre-1989 and post-1989, since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored annually to demonstrate that the average Rn-222 flux does not exceed 20 pCi/(m^2-sec).

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are the White Mesa mill and the proposed Piñon Ridge mill owned by Energy Fuels; the Shootaring Canyon mill owned by Uranium One, Inc.; and the Sweetwater mill owned by Kennecott Uranium Co. . Of the three companies that own conventional mills, one, Energy Fuels, is classified as a small business, on the basis that they have fewer than 500 employees (EF 2012 states that Energy Fuels has 255 active employees in the U.S.).

Energy Fuels' White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full, it will be contoured and covered. Then, a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings.

Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Section 5.4 describes the proposed GACTs. Because both the White Mesa mill and the proposed Piñon Ridge mill are in compliance with the proposed GACT, it can be concluded that the rulemaking will not impose any new economic impacts on small business (i.e., Energy Fuels). For White Mesa, the proposed rule will actually result in a cost saving as Energy Fuels will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in 40 CFR 192.32(a)(1) and that a minimum depth of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to ISL facilities and heap leach facilities. Currently, there are six operating ISLs (as shown in Table 8) and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco; Alta Mesa owned by Mestena Uranium, LLC; Willow Creek owned by Uranium One, Inc.; and Hobson and La Palangana owned by Uranium Energy Corp. Again, using the criterion of fewer than 500 employees, Mestena Uranium, LLC, and Uranium Energy Corp. are small businesses, while both Cameco and Uranium One, Inc., which is owned by Rosatom, are large businesses.

All of the evaporation ponds at the four conventional mills and the six ISLs were built in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

In addition to the operating ISLs listed above, Table 9 shows that there are nine ISLs have been proposed for licensing. These are: Dewey Burdock owned by Powertech Uranium Corp.; Nichols Ranch owned by Uranerz Energy Corp.; 'Jab and Antelope' and Moore Ranch owned by Uranium One Americas, Inc., a subsidiary of Rosatom; Church Rock and Crownpoint owned by Hydro Resources, Inc. a subsidiary of Uranium Resources, Inc.; Ross owned by Strata Energy Inc., a subsidiary of Australian-based Peninsula Energy Limited; Goliad owned by Uranium Energy Corp.; and Lost Creek owned by Lost Creek ISR, LLC a subsidiary of Ur-Energy. All of these companies, except Rosatom, are small businesses.

According to the licensing documents submitted by the owners of the proposed ISLs, all will be constructed in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and while in standby status.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. Considering that the current (i.e., January 30, 2012) price

of U_3O_8 is $52 per pound (UxC 2012), this cost does not pose a significant impact to any of these small entities.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30-percent moisture content by weight during operations. Although no heap leach facilities are currently licensed, the small business Energy Fuels is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that has been presented (Titan 2011), the Energy Fuels facility will have an evaporation pond, a collection pond, and a raffinate pond. All three ponds will be double lined with leak detection. Based on the unit and facility cost comparisons presented in **Table 53** and **Table 54**, respectively, the implementation of the proposed GACTs at a heap leach facility (such as Sheep Mountain) would increase the U_3O_8 production cost by about 5%. Based on this small increase, the Sheep Mountain Project would: 1) remain competitive with U_3O_8 production cost for other types of facilities, and 2) continue to provide Energy Fuels with a profit. Energy Fuels is the only entity known to be preparing to submit a license application for a heap leach facility.

Of the 20 uranium recovery facilities identified above, 13 are owned by small businesses. As documented above in this report, those 13 facilities are either already in compliance with the proposed GACTs, with no additional impact, or compliance with the GACTs would not pose a significant impact to any of the small businesses (e.g., $52.03 lb^{-1} versus $52 lb^{-1}). Thus, after considering the economic impacts of this proposed rule on small entities, it is concluded that this action will not have a significant economic impact on a substantial number of small entities.

7.0 REFERENCES

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From: Rosnick, Reid
Sent: Tuesday, April 22, 2014 8:04 AM
To: Miller, Beth
Subject: Docket Switcheroo

Hi Beth,

OK, please take the attached document and pdf it. Then, in the docket, please remove the document at EPA-HQ-OAR-2008-218-DRAFT-0087 and replace it with the newly pdf document.

Then, please add the attached Stakeholder Conference Call notes from April 3, 2014 as a new docket entry.

Thank you Beth!

Reid

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Subpart W Stakeholders Conference Call
April 3, 2014

ATTENDEES

EPA: Reid Rosnick, Susan Stahle (OGC), Angelique Diaz (Region 8)

Environmental Groups/Tribes: Sarah Fields, Uranium Watch; Aaron Mentzes, Earthworks; Paul Robinson, SW Research and Information Center; Scott Clow, Mike King, Ute Mountain Ute Tribe

Uranium Industry/Other: Jim Cain, Cotter; Scott Bakken, Cameco; Richard Bluebaugh, Powertech; Darrel Lyles, SENES; Richard Potter

UPDATE

Reid began the call with a welcome and by taking attendance. Reid had a couple of items to share.

EPA has addressed the comments from OMB staff and other interagency comments successfully. OMB staff has cleared the draft rulemaking and it was reviewed by OMB management. OMB officially cleared the draft proposed rulemaking on January 13, 2014. The package was returned to EPA, where several housekeeping items were be addressed, and the package began its trip to the Administrator's office for signature. After signature the proposed rule will be sent to the Office of the Federal Register for publication, probably this month.

DISCUSSION

Sarah: How long is the comment period?
Reid: 90 days

Scott: Has EPA considered placing the rule (when it's published) on the American Indian Environmental Office (AIEO) portion of EPA's website? Reid will look into it. Joann Chase is a contact in AIEO.

There was a request for a summary of what is in the proposed rule. Reid stated that that information cannot be released until after the proposal has been published in the Federal Register.

Question on if the proposed rule… will it include response to comments received – Reid clarified the process. The final rulemaking will include a response to all the comments in the preamble or a separate document, depending on the volume of comments. You will see some comments received to date addressed in the rule.

Sarah – Will it go on the federal rulemaking website? www.regulations.gov Reid – yes, the rulemaking will have a specific number and you can either 1. Submit a comment or 2. Read other comments at that website.

Sarah –Any idea of schedule after comments received? Reid – it will depend on the scope of the comments and if they have been addressed already or not.

Darryl – Joined late and asked for a process update. Reid – summarized info stated in his update.

Next call: Thursday, July 3, 2014 at 11 AM Eastern Time.

____________________________________end_____________________________________

Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250)

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
February 2014

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ACRONYMS AND ABBREVIATIONS

ACE	Army Corps of Engineers
AEA	Atomic Energy Act
AIRDOS	AIR DOSe
ALARA	as low as reasonably achievable
AMC	American Mining Congress
ANPR	Advance Notice of Proposed Rulemaking
$BaCl_2$	barium chloride
BEIR	Biological Effects of Ionizing Radiation
BID	background information document
CAA	Clean Air Act
CAP88	Clean Air Act Assessment-1988
CFR	*Code of Federal Regulations*
CHP	certified health physicist
Ci/yr	curies per year
cm	centimeter
cm/sec	centimeter per second
cm^2/sec	square centimeter per second
CPI	consumer price index
CPP	Central Processing Plant
DARTAB	Dose And Risk TABulation
DOE	Department of Energy
EDF	Environmental Defense Fund
EIA	Energy Information Administration
EIS	environmental impact statement
EPA	Environmental Protection Agency
E-PERM	Electric Passive Environmental Radon Monitor
FGR	Federal Guidance Report
FR	*Federal Register*
ft	feet
g/cc	gram per cubic centimeter
G&A	general and administrative

GACT	generally available control technology
GCL	geosynthetic clay liner
GHG	Greenhouse Gas
gpm	gallons per minute
gpm/ft^2	gallons per minute per square foot
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HRTM	Human Respiratory Tract Model
ICRP	International Commission on Radiological Protection
in/yr	inches per year
ISL	in-situ leach
ISR	in-situ recovery
km	kilometer
L	liter
LAACC	large-area activated charcoal collector
lb	pound
LCF	latent cancer fatalities
L/d	liters per day
LLDPE	linear low-density polyethylene
LoC	line of credit
m^2	square meters
m^3/hr	cubic meters per hour
m/sec	meters per second
MACT	maximum achievable control technology
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mi	mile
MIR	maximum individual risk
mph	miles per hour
mrem	millirem
mSv	millisievert
N.C.	not calculated
NESHAP	National Emission Standard for Hazardous Air Pollutants

N.G.	not given
NMA	National Mining Association
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
O&M	operation and maintenance
ORISE	Oak Ridge Institute for Science and Education
pCi	picocurie
pCi/(ft^2-sec)	picocurie per square foot per second
pCi/g	picocurie per gram
pCi/L	picocurie per liter
pCi/(m^2-sec)	picocurie per square meter per second
PIPS	passive implanted planar silicon
POO	Plan of Operation
PVC	polyvinyl chloride
R&D	research and development
Ra	radium
RADRISK	RADiation RISK
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent in man
RMEI	reasonably maximally exposed individual
Rn	radon
RSO	radiation safety officer
SC	Sierra Club
SF	square foot
tpd	tons per day
U	uranium
U_3O_8	triuranium octoxide
UMTRCA	Uranium Mill Tailings Remedial Control Act
WCS	Waste Control Specialists, LLC
WL	working level
WLM	working level month
ZnS(Ag)	silver doped zinc sulfide

1.0 EXECUTIVE SUMMARY

The purpose of this report is to present the reader with an understanding of the facilities being regulated under this National Emission Standard for Hazardous Air Pollutant (NESHAP). The report also presents the technical bases that the Environmental Protection Agency (EPA or the Agency) has used for evaluating the risks from existing facilities and for determining that the prescribed work practice standards represent generally available control technology (GACT), as required by section 112(d) of the 1990 amendments to the Clean Air Act (CAA).

The Agency is also defining the scope of its review of the Subpart W NESHAP to include the waste impoundments at in-situ leach (ISL) uranium recovery facilities and heap leach recovery operations, since all post-1989 impoundments, which potentially contain uranium byproducts, are considered to be under the NESHAP. The Agency has defined the scope of the review to include regulation of the heap leach pile, as it believes the pile contains byproduct material during operations.

1.1 Introduction, History, and Basis

After a brief introduction, this report describes the events that led the Agency to promulgate a NESHAP for radon emissions from operating uranium mill tailings on December 15, 1989, in Section 40 of the *Code of Federal Regulations* (40 CFR) Part 61, Subpart W. The 1977 amendments to the CAA include the requirement that the Administrator of EPA determines whether radionuclides should be regulated under the act. In December 1979, the Agency published its determination in the *Federal Register* (FR) that radionuclides constitute a hazardous air pollutant (HAP) within the meaning of section 112(a)(1). In 1979, the Agency also developed a background information document (BID) to characterize "source categories" of facilities that emit radionuclides into ambient air, and in 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID. On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings, establishing an emission standard of 20 picocuries per square meter per second (pCi/(m^2-sec)) for radon (Rn)-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. Between 1984 and 1986, the Environmental Defense Fund (EDF), the Natural Resources Defense Council (NRDC), the Sierra Club (SC), and the American Mining Congress (AMC) filed various court petitions seeking modifications to the NESHAPs.

In a separate decision, the U.S. District Court for the District of Columbia outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk, and then considering additional factors, such as costs to establish the "ample margin of safety."

Section 112(q)(1) of the 1990 CAA Amendments requires that certain emission standards shall be reviewed, and if appropriate, revised to comply with the requirements of section 112(d). Subpart W is under review/revision in response to that requirement. Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. In accordance with section 112(d), the Administrator has

elected to promulgate standards that provide for the use of GACT or management practices to regulate radon emissions from uranium recovery facility tailings impoundments noted in Subpart W.

1.2 The Uranium Extraction Industry Today

From 1960 to the mid-1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. In the early years, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. Because of overproduction, the price of uranium rapidly declined in the 1980s. The declining uranium market could not support the existing number of uranium recovery operations, and many of the uranium recovery facilities in the United States were closed, decommissioned, and reclaimed. In the mid- to late 1980s, several uranium recovery projects employing the solution, or ISL, mining process came on line. However, because of a need for clean energy, a need to develop domestic sources of energy, and other reasons, current forecasts predict growth in the U.S. uranium recovery industry over the next decade and continuing into the future.

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. Representative of the extent of the conventional uranium milling operations that currently exist and are licensed in the United States are the mills at Sweetwater, Wyoming; Shootaring Canyon, Utah; and White Mesa, Utah. Only the White Mesa mill is currently in operation. A conventional mill at Piñon Ridge, Colorado, is currently in the planning and licensing stage. Additionally, a total of six potentially new conventional mill facilities are being discussed in New Mexico, Wyoming, Utah, and Arizona.

The radon data for the conventional mill tailings impoundments indicate that the radon exhalation rates from the surfaces are generally within the Subpart W standard of 20 pCi/(m^2-sec), but occasionally the standard may be exceeded. When that occurs, the tailings are usually covered with more soil, and the radon flux is reduced.

Solution, or ISL, mining is defined as the leaching or recovery of uranium from the host rock by chemicals, followed by recovery of uranium at the surface. ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects in the 1980s demonstrated solution mining to be a viable uranium recovery technique. Ten ISL facilities are currently operating (see Table 8, page 33), and about 23 other facilities are restarting, expanding, or planning for new operations.

Uranium is leached into solution through the injection into the ore body of a lixiviant. A lixiviant is a chemical solution used to selectively extract (or leach) uranium from ore bodies where they are normally found underground. The injection of a lixiviant essentially reverses the geochemical reactions that are associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. The liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. Since radium (Ra)-226 is present in the liquid bled from the lixiviant, radon will be generated in and released from the ISL's evaporation/holding ponds/ impoundments. The amount of radon released from these evaporation/holding ponds has been estimated and found to be small. (See Section 3.3.1.)

Heap leaching is a process by which chemicals are used to extract the economic element (for the purposes of Subpart W, uranium) from the ore. A large area of land is leveled with a small gradient, and a liner and collection system are installed. Ore is extracted from a nearby surface or underground mine and placed in heaps atop the liner. A leaching agent (usually an acid) will then be sprayed on the ore. As the leaching agent percolates through the heap, the uranium is mobilized and enters the solution. The solution will flow to the bottom of the pile and then along the gradient into collecting pools, from which it will be pumped to an onsite processing plant. In the past, a few commercial heap leach facilities operated but none is now operating. Planning and engineering have been undertaken for two heap leach facilities, one in Wyoming and the other in New Mexico.

A brief review of Method 115, "Monitoring for Radon-222 Emissions" (40 CFR 61, Appendix B) (SC&A 2008), demonstrated that its use can still be considered current for monitoring radon flux from conventional uranium tailings impoundments. It is not an option for measuring radon emissions from evaporation or holding ponds because there is no solid surface on which to place the monitors.

1.3 Current Understanding of Radon Risk

A description of how the understanding of the risk presented by radon and its progeny has evolved since the 1989 BID was published examines three parameters: (1) the radon progeny equilibrium fraction, (2) the epidemiological risk coefficients, and (3) the dosimetric risk coefficients. Additionally, SC&A (2011) used the computer code CAP88 version 3.0 (Clean Air Act Assessment Package-1988) to analyze the radon risk from eight operating uranium recovery sites, plus two generic sites.

The lifetime (i.e., 70-year) maximum individual risk (MIR)[1] calculated using data from eight actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments, while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments. (SC&A 2011)

To protect public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to a lifetime MIR of approximately 1 in 10 thousand (i.e., 10^{-4}). Although the calculated high end of the lifetime MIR range is above 10^{-4}, there are several mitigating factors. First, the highest MIR was calculated for a hypothetical mill at an eastern generic site. If an actual mill were to be located at the Eastern Generic site, it would be required to reduce its radon

[1] In this BID all risks are presented as mortality risks. If it is desired to estimate the morbidity risk, simply multiply the mortality risk by 1.39.

emissions as part of its licensing commitments. Also, the assumptions that radon releases occur continuously for 70 years and that the same reasonably maximally exposed individual (RMEI) is exposed to those releases for the entire 70 years are very conservative.

Likewise, the risk assessment estimated that the risk to the population from all eight real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 kilometers (km) of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km (50 miles) was 0.0043, which was less than one case every 200 years, for existing impoundments and 0.014, or approximately one case every 70 years, for new impoundments.

1.4 Evaluation of Subpart W Requirements

EPA has determined that radon releases from uranium recovery facilities are HAPs, as defined by the CAA. Furthermore, no radionuclide (including radon) releases have met the CAA's definition of major sources, and thus radon releases from uranium recovery facilities are classified as area sources. (See Section 5.3.) Under section 112(d) of the CAA, the EPA Administrator may elect to promulgate standards or requirements applicable to area sources that provide for the use of GACTs or management practices to reduce emissions of HAPs. For the four source categories of radon releases from uranium recovery facilities, the Administrator has elected to promulgate GACTs as follows:

Conventional Impoundments – Constructed on or before December 15, 1989

GACT The flux standard of 20 pCi/(m^2-sec) contained in the current 40 CFR 61.252(a) will no longer be required; require that these conventional impoundments be operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Conventional Impoundments – Constructed after December 15, 1989

GACT Retain the standard that conventional impoundments be designed, constructed, and operated to meet one of two work practices: phased disposal and continuous disposal, contained in the current 40 CFR 61.252(b).

Nonconventional Impoundments – Where uranium byproduct material (i.e., tailings) are contained in ponds and covered by liquids

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restrictions, and require that during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

Heap Leach Piles

GACT Retain the design and construction requirements of 40 CFR 192.32(a)(1), and require that the moisture content of the operating heap be maintained at or greater than 30 percent.

Additionally, the analyses provided in this BID support the following findings:

- Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.
- By requiring that conventional impoundments be designed, constructed, and operated to meet one of two 40 CFR 61.252(b) work practices (i.e., phased disposal and continuous disposal), adoption of an emission limit (e.g., 20 pCi/(m^2-sec)) is not necessary to protect public health.
- The requirement that conventional impoundments use either phased or continuous disposal technologies is appropriate to ensure that public health is protected with an ample margin of safety, and is consistent with section 112(d) of the 1990 CAA Amendments that require standards based on GACT.
- The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures/facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

1.5 Economic Impacts

The economic impact analysis to support any potential revision of the Subpart W NESHAP is presented in four distinct areas:

(1) A review and summary of the original 1989 economic assessment and supporting documents are provided.

(2) The baseline economic costs for development of new conventional mills, ISL facilities, and heap leach facilities are developed and presented.

(3) The anticipated costs to the industries versus the environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

(4) Finally, information is provided on the economic impacts to disadvantaged and tribal populations and on environmental justice.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For conventional mills, data from the proposed new mill at the Piñon Ridge project in Colorado were used. Data from two proposed new ISL facilities were used; the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14 to 15-year production period,

which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Table 1 summarizes the unit cost (dollars per pound) estimates for all four uranium recovery facilities. As shown, on a unit cost basis, heap leach facilities are projected to be the least expensive, and the two ISL facilities the most expensive.

Table 1: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC	w/o LoC
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87

Because the four proposed GACTs are not expected to change the manner in which any of the uranium recovery facilities are designed, built, or operated, no additional economic benefits or costs are associated with the proposed Subpart W revisions.

At 10 of the 15 existing or proposed uranium recovery sites analyzed, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is white exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either African-American or Other is less than the national norm, while the percentage of African-Americans and Others is less than the regional norm at all but one site. The analysis found that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are more economically advantaged (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the United States' 50th percentile. On the other hand, five sites are located in areas where the per capita nonfarm wealth is below the country's 10th percentile.

2.0 INTRODUCTION, HISTORY, AND BASIS

On December 15, 1989, EPA promulgated a NESHAP for radon emissions from operating uranium mill tailings (40 CFR 61, Subpart W). Section 112(q) of the CAA, as amended, requires EPA to review, and if appropriate, revise or update the Subpart W standard on a timely basis (within 10 years of passage of the CAA Amendments of 1990). Soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically. However, recent developments in the market for uranium have led to some companies expressing their intention to pursue licensing of new facilities, and therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations before these proposed facilities become operational.

Two separate standards are defined in Subpart W. The first states that existing sources (facilities constructed before December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) or 1.9 picocuries per square foot per second (pCi/(ft^2-sec)) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA showing the results of the compliance monitoring. The second Subpart W standard prescribes that for new sources (facilities constructed on or after December 15, 1989), no new tailings impoundment can be built unless it is designed, constructed, and operated to meet one of the two following work practices:

(1) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and meet the requirements of 40 CFR 192.32(a) as determined by the U.S. Nuclear Regulatory Commission (NRC). The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

(2) Continuous disposal of tailings such that tailings are dewatered and immediately disposed of with no more than 10 acres uncovered at any time and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The work practice standard also applies to operations at existing sources, once their existing impoundments can no longer accept additional tailings.

The facilities covered by Subpart W are uranium recovery facilities, also licensed and regulated by the NRC or its Agreement States. The NRC becomes involved in uranium recovery operations once the ore is processed and chemically altered. This occurs either in a uranium mill (the next step from a conventional mine) or during ISL or heap leach. For this reason, the NRC regulates ISL facilities, as well as uranium mills and the disposal of liquid and solid wastes from uranium recovery operations (including mill tailings), but does not regulate the conventional uranium mining process. The NRC regulations for the protection of the public and workers from exposure to radioactive materials are found in 10 CFR 20, while specific requirements for the design and operation of uranium mills and disposition of tailings are found in 10 CFR 40, Appendix A.

2.1 Document Contents and Structure

This report is divided into six sections. The first two sections are the Executive Summary and this introduction, which includes discussions of the history of the development of Subpart W (Section 2.2) and the basis for the 1989 risk assessments (Section 2.3). Four technical sections, the contents of which are summarized below, follow this introductory section.

2.1.1 The Uranium Extraction Industry Today

After a brief history of the uranium market, Section 3.0 identifies both the uranium recovery facilities that are licensed today and those that have been proposed to be built in the future.

For currently existing impoundments, Section 3.0 presents the following information:

- Data on the configuration of current impoundments.
- Results of compliance monitoring.

Section 3.0 also presents a description of the Method 115 radon monitoring method.

2.1.2 Current Understanding of Radon Risk

Section 4.0 presents a qualitative analysis of the changes that have occurred in the understanding of the risks associated with Rn-222 releases from impoundments. Emphasis is on the changes to the predicted radon progeny equilibrium fractions and the epidemiological and dosimetric lifetime fatal cancer risk per working level (WL). Section 4.0 also discusses how the current analytical computer model, CAP88 Version 3.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Finally, Section 4.4 presents dose and risk estimates for several current uranium recovery facilities.

2.1.3 Evaluation of Subpart W

The evaluation of Subpart W requirements required the analyses of some key issues to determine if the current technology has advanced since the 1989 promulgation of the rule. The key issues include: existing and proposed uranium recovery facilities, Resource Conservation and Recovery Act (RCRA) comparison, regulatory history, tailings impoundment technologies, radon measurement methods, and risk assessment. Section 5.0 discusses these key issues, in order to determine whether the requirements of Subpart W are necessary and sufficient.

Based on the evaluation of the key issues and in keeping with section 112(d) of the CAA, Section 5.0 also presents GACT radon emission control standards for three categories of uranium recovery facilities:

(1) Conventional impoundments.

(2) Nonconventional impoundments, where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids.

(3) Heap leach piles.

In addition to the key issues, several issues that need clarification in order to be more fully understood are presented and described. The issues in need of clarification include extending monitoring requirements, defining when the closure period for an operating facility begins, interpretation of the term "standby," the role of weather events, and monitoring reporting requirements.

2.1.4 Economic Impact Analysis

Section 6.0 of the document reviews and reassesses all the additional economic impacts that may occur due to the extension and revision of the Subpart W NESHAP and specifically addresses the following:

- A review and summary of the original 1989 economic assessment and supporting documents are provided.

- The baseline economic costs for the development of new conventional mills and ISL and heap leach facilities are developed and presented.

- The anticipated costs to industries versus environmental and public health benefits to be derived from each of the four proposed GACTs are discussed.

- Finally, information is provided relating to economic impacts on disadvantaged populations and tribal populations and to environmental justice.

2.2 History of the Development of the Subpart W NESHAP

The following subsections present a brief history of the development of environmental radiation protection standards by EPA, with particular emphasis on the development of radionuclide NESHAPs.

Table 2 presents a partial time line sequence of EPA's radiation standards with emphasis on the NESHAPs, including Subpart W.

Table 2: Partial Timeline of EPA's Radiation Standards

January 13, 1977	EPA publishes 40 CFR 190 – Environmental Protection Standards for Nuclear Power Operations.
August 1979	EPA publishes first BID, *Radiological Impacts Caused by Emission of Radionuclides into Air in the United States*, EPA 520/7-79-006.
December 27, 1979	EPA determines radionuclides constitute a HAP – (section 112(a)(1) amendments to the CAA.
January 5, 1983	EPA under UMTRCA promulgates, 40 CFR 192, Subpart B "Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites," that for inactive tailings or after closure of active tailings, the radon flux should not exceed an average release rate of 20 pCi/(m^2-sec).
March 1983	EPA publishes draft report, *Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-83-001, and proposes radionuclide NESHAPs for: 1. DOE and Non-NRC-Licensed Federal Facilities. 2. NRC-Licensed Facilities. 3. Elemental Phosphorus Plants. 4. Underground Uranium Mines.
September 30, 1983	EPA issues standards under UMTRCA (40 CFR 192, Subparts D and E) for the management of tailings at locations licensed by the NRC or the States under Title II of the UMTRCA. These standards do not specifically limit Rn-222 emissions until after closure of a facility; however, they require ALARA procedures for Rn-222 control.
February 17, 1984	SC sues EPA (District Court for Northern California) and demands EPA promulgate final NESHAP rules for radionuclides or find that they do not constitute a HAP (i.e., "de-list"" the pollutant). In August 1984, the court grants the SC motion and orders EPA to take final actions on radionuclides by October 23, 1984.
October 22, 1984	EPA issues *Final Background Information Document Proposed Standards for Radionuclides*, EPA 520/1-84-022-1and -2.
October 23, 1984	EPA withdraws the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities.

Table 2: Partial Timeline of EPA's Radiation Standards

December 1984	District Court finds EPA in contempt. EPA and SC submit motion to court with schedule (August 5, 1985). Court orders EPA to issue final standards for Rn-222 emissions from licensed uranium mills and mill tailings impoundments by May 1, 1986 (later moved to August 15, 1986).
February 6, 1985, to September 24, 1986	EPA promulgates NESHAPs for: 1. DOE Facilities (February 1985). 2. NRC-Licensed Facilities and Non-DOE Federal Facilities (February 1985). 3. Elemental Phosphorus Plants (February 1985). 4. On April 17, 1985, Rn-222 emissions from underground uranium mines added. 5. On September 24, 1986, Rn-222 from licensed uranium mill tailings added – 20 pCi/(m^2-sec) and the work practice standard for small impoundments or continuous disposal.
November 1986	AMC and EDF file petitions challenging the NESHAPs for operating uranium mills.
July 28, 1987	The Court of Appeals for the District of Columbia remanded to EPA the NESHAP for vinyl chloride (see text). Given the decision, EPA petitioned the court for a voluntary remand of standards and asked that the pending litigation on all issues relating to its radionuclide NESHAPs be placed in abeyance during the rulemaking. EPA also agreed to reexamine all issues raised by parties to the litigation. The court granted EPA's petition on December 8, 1987.
September 14, 1989	EPA promulgates NESHAPs for benzene, etc. Importantly, EPA establishes the "fuzzy bright line." That is, EPA's approach to residual risk under section 112 (as advanced in the Hazardous Organic NESHAPs and approved by the District of Columbia Circuit in *NRDC v. EPA*) as essentially establishing a "fuzzy bright line" with respect to carcinogens, whereby EPA must eliminate risks above one hundred in one million (1 in 10,000) , does not have to address risks below one in one million (1 in 1,000,000), and has discretion to set a residual risk standard somewhere in between (Jackson 2009). In a second step, EPA can consider whether providing the public with "an ample margin of safety" requires risks to be reduced further than this "safe" level, based on EPA's consideration of health information and other factors such as cost, economic impact, and technological feasibility (Jackson 2009).
September 1989	EPA publishes the NESHAPs for radionuclides. The agency prepared an EIS in support of the rulemaking. The EIS consisted of three volumes: Volume I, *Risk Assessment Methodology*; Volume II, *Risk Assessments*; and Volume III, *Economic Assessment.*
December 15, 1989	EPA promulgates NESHAPs for: • Subpart B: National Emission Standards for Radon Emissions from Underground Uranium Mines. • Subpart H: Emissions of Radionuclides Other than Radon from DOE Facilities. • Subpart I: National Emissions of Radionuclides Other than Radon from DOE Facilities by NRC and Federal Facilities Not Covered by Subpart H. • Subpart K: Radionuclide Emissions from Elemental Phosphorus Plants. • Subpart Q: Radon Emissions from DOE Facilities. • Subpart R: Radon Emissions from Phosphogypsum Stacks. • Subpart T: Radon Emissions from the Disposal of Uranium Mill Tailings. (rescinded effective June 29, 1994; published in the FR July 15, 1994). • Subpart W: Radon Emissions from Operating Uranium Mill Tailings Piles.
November 15, 1990	President signs the CAA Amendments of 1990. Part of the act requires that some regulations passed before 1990 be reviewed and, if appropriate, revised within 10 years of the date of enactment of the CAA Amendments of 1990. The amendments also instituted a technology-based framework for HAPs. Sources that are defined as large emitters are to employ MACT, while sources that emit lesser quantities may be controlled using GACT.

2.2.1 The 1977 Amendments to the Clean Air Act

On January 13, 1977 (FR 1977), EPA established environmental protection standards for nuclear power operations pursuant to its authority under the Atomic Energy Act (AEA). The standards in 40 CFR 190, which covered all licensed facilities that are part of the uranium fuel cycle, established an annual limit on exposure to members of the public. The NRC or its Agreement States, which licenses these facilities, has the responsibility for the enforcement of the Part 190 standards. Additionally, the NRC imposes the requirement that licensees keep all exposures "as low as reasonably achievable" (ALARA). The Part 190 standards exempted Rn-222 from the annual limit because of the uncertainties associated with the risk of inhaled radon.

After the promulgation of 40 CFR 190, the 1977 amendments to the CAA were passed. These amendments included the requirement that the Administrator of EPA determine whether radionuclides should be regulated under the CAA.

In December 1979, the Agency published its determination in the *Federal Register* (FR 1979) that radionuclides constitute a HAP within the meaning of section 112(a)(1). As stated in the FR, radionuclides are known to cause cancer and genetic defects and to contribute to air pollution that may be anticipated to result in an increase in mortalities or an increase in serious, irreversible, or incapacitating reversible illnesses. The Agency further determined that the risks posed by emissions of radionuclides into the ambient air warranted regulation and listed radionuclides as a HAP under section 112.

Section 112(b)(1)(B) of the CAA requires the Administrator to establish NESHAPs at a "level which (in the judgment of the Administrator) provides an ample margin of safety to protect the public health" or find that they are not hazardous and delist them.

2.2.2 Regulatory Activities between 1979 and 1987

To support the development of radionuclide NESHAPs, the Agency developed a BID to characterize "source categories" of facilities that emit radionuclides into ambient air (EPA 1979). For each source category, EPA developed information needed to characterize the exposure of the public. This included characterization of the facilities in the source category (numbers, locations, proximity of nearby individuals); radiological source terms (curies/year (Ci/yr)) by radionuclide, solubility class, and particle size; release point data (stack height, volumetric flow, area size); and effluent controls (type, efficiency). Doses to nearby individuals and regional populations caused by releases from either actual or model facilities were estimated using computer codes (see Section 2.3).

In 1983, EPA proposed radionuclide NESHAPs for four source categories based on the results reported in a new BID (EPA 1983). These four source categories were the Department of Energy (DOE) and non-NRC-licensed federal facilities, NRC-licensed facilities, elemental phosphorus plants, and underground uranium mines. For all other source categories considered in the BID (i.e., coal-fired boilers, the phosphate industry and other extraction industries, uranium fuel-cycle facilities, uranium mill tailings, high-level waste disposal, and low-energy accelerators), the Agency found that NESHAPs were not necessary. In reaching this conclusion, the Agency found that either the levels of radionuclide emissions did not cause a significant dose to nearby

individuals or the regional populations, the additional effluent controls were not cost effective, or the existing regulations under other authorities were sufficient to keep emissions at an acceptable level.

During the public comment period on the proposed NESHAPs, the Agency completed its rulemaking efforts under the Uranium Mill Tailings Remedial Control Act (UMTRCA) to establish standards (40 CFR 192) for the disposal of uranium mill tailings. With respect to the emission of Rn-222, the UMTRCA standards established a design standard calling for an Rn-222 flux rate of no more than 20 pCi/(m^2-sec).

In February 1984, the SC sued EPA in the U.S. District Court for Northern California (*Sierra Club v. Ruckelshaus*, No. 84-0656) (EPA 1989), demanding that the Agency promulgate final NESHAPs or delist radionuclides as a HAP. The court sided with the plaintiffs and ordered EPA to promulgate final regulations. In October 1984, EPA withdrew the proposed NESHAPs for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities, finding that existing control practices protected the public health with an ample margin of safety (FR 1984). EPA also withdrew the NESHAP for underground uranium mines, but stated its intention to promulgate a different standard and published an Advance Notice of Proposed Rulemaking (ANPR) to solicit additional information on control methods. It also published an ANPR for licensed uranium mills. Finally, the FR notice affirmed the decision not to regulate the other source categories identified in the proposed rule, with the exception that EPA was doing further studies of phosphogypsum stacks to see if a standard was needed.

In December 1984, the U.S. District Court for Northern California found EPA's action of withdrawing the NESHAPs to be in contempt of the court's order. Given the ruling, the Agency issued the final BID (EPA 1984) and promulgated final standards for elemental phosphorus plants, DOE facilities, and NRC-licensed facilities in February 1985 (FR 1985a), and a work practice standard for underground uranium mines in April of the same year (FR 1985b).

The EDF, the NRDC, and the SC filed court petitions seeking review of the October 1984 final decision not to regulate the source categories identified above, the February 1985 NESHAPs, and the April 1985 NESHAP. The AMC also filed a petition seeking judicial review of the NESHAP for underground uranium mines.

On September 24, 1986, the Agency issued a final NESHAP for operating uranium mill tailings (FR September 24, 1986), which established an emission standard of 20 pCi/(m^2-sec) for Rn-222 and a work practice standard requiring that new tailings be disposed of in small impoundments or by continuous disposal. One justifications for the work practices was that, while large impoundments did not pose an unacceptable risk during active operations, the cyclical nature of the uranium milling industry could lead to prolonged periods of plant standby and the risk that the tailings impoundments could experience significant drying, with a resulting increase in Rn-222 emissions. Furthermore, the Agency believed that the two acceptable work practices actually saved the industry from the significant costs of constructing and closing large impoundments before they were completely filled. With the promulgation of the NESHAP for operating uranium mill tailings, three EPA regulations covered the releases of radionuclides into

the air during operations and tailings disposal at uranium mills: 40 CFR 190; 40 CFR 192; and 40 CFR 61, Subpart W.

In November 1986, the AMC and the EDF filed petitions challenging the NESHAP for operating uranium mill tailings.

2.2.3 Regulatory Activities between 1987 and 1989

While the petitions filed by the EDF, NRDC, SC, and AMC were still before the courts, the U.S. District Court for the District of Columbia, in *NRDC v. EPA* (FR 1989b), found that the Administrator had impermissibly considered costs and technological feasibility in promulgating the NESHAP for vinyl chloride. The court outlined a two-step decision process that it would find acceptable, first establishing a standard based solely on an acceptable level of risk and then considering additional factors, such as costs, to establish the "ample margin of safety." Given the court's decision, the Agency reviewed how it had conducted all of its NESHAP rulemakings and requested that the court grant it a voluntary remand for its radionuclide NESHAPs. As part of an agreement with the court and the NRDC, the Agency agreed to reconsider all issues that were currently being litigated, and it agreed that it would explicitly consider the need for a NESHAP for two additional source categories: radon from phosphogypsum stacks and radon from DOE facilities. The subsequent reconsideration became known as the radionuclide NESHAPs reconsideration rulemaking.

2.2.4 1989 Radionuclide NESHAPs Reconsideration Rulemaking

In the radionuclide NESHAPs reconsideration rulemaking, the Administrator relied on a "bright line" approach for determining whether a source category required a NESHAP. This meant that no NESHAP was required if all individuals exposed to the radionuclide emissions from the facilities in the source category were at a lifetime cancer risk of less than 1 in 1,000,000, and less than 1 fatal cancer per year was estimated to be incurred in the population. For source categories that did not meet this "bright line" exclusion, the Agency adopted a two-step, multi-factor approach to setting the emission standards.

The first step established a presumptively acceptable emissions level corresponding to an MIR of about 1 in 10,000 lifetime cancer risk, with the vast majority of exposed individuals at a lifetime risk lower than 1 in 1,000,000, and with less than 1 total fatal cancer per year in the exposed population. If the baseline emissions from a source category met these criteria, they were presumed adequately safe. If they did not meet these criteria, then the Administrator was compelled by his nondiscretionary duty to determine an emission limit that would correspond to risks that were adequately safe.

After baseline emissions were determined to be adequately safe or an adequately safe alternative limit defined, the analysis moved to the second step, where reduced risks for alternative emission limits were evaluated, along with the technological feasibility and costs estimated to be associated with reaching lower levels. In the two-step approach, the Administrator retained the discretion to decide whether the NESHAP should be set at these lower limits.

2.2.5 1990 Amendments to the Clean Air Act

NESHAP Subpart W is under consideration for revision because section 112(q)(1) requires that certain emission standards in effect before the date of enactment of the 1990 CAA Amendments shall be reviewed and, if appropriate, revised to comply with the requirements of section 112(d). As stated previously, soon after the original promulgation of the standard, the uranium industry in the United States declined dramatically, negating the need to perform the Subpart W review. However, as discussed in Section 3.1, recent developments in the market for uranium have led to forecasts of growth in the uranium market over the next decade and continuing for the foreseeable future. Therefore, EPA is reviewing the necessity and adequacy of the Subpart W regulations at this time, before facilities developed in response to those forecasts become operational.

Section 112(d) of the 1990 CAA Amendments lays out requirements for promulgating technology-based emissions standards for new and existing sources. Section 112(c) lists radionuclides, including radon, as an HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for the regulation of emissions of HAPs.

The regulation of HAPs at major sources is dictated by the use of maximum achievable control technology (MACT). Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating an MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

EPA has determined that radon emissions from uranium recovery facility tailings impoundments are an area source and that GACT applies (see Section 5.3). The Senate report on the legislation (U.S. Senate 1989) contains additional information on GACT and describes GACT as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.*

Determining what constitutes a GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. It is also necessary to consider the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are considered to determine whether such technologies and practices could be generally available for the area source category at issue. Finally, as noted above, in determining GACTs for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

2.3 Basis for the Subpart W 1989 Risk Assessment and Results

In the 1989 NESHAP for operating uranium mill tailings, exposures and risks were estimated using a combination of actual site data for existing impoundments and model or representative facilities for future impoundments and computer models. The 1989 risk assessment reflected the estimated risks to the regional (0-80 km [0-50 mile]) populations associated with the 11 conventional mills that were operating or in standby[2] at that time. Mathematical models were developed to simulate the transport of radon released from the mill tailings impoundments and the exposures and risks to individuals and populations living near the mills. Those models were programmed into three computer programs for the 1989 risk assessment: AIRDOS-EPA, RADRISK, and DARTAB. The paragraphs that follow briefly discuss each of these computer programs.

AIRDOS-EPA was used to calculate radionuclide concentrations in the air, rates of deposition on the ground, concentrations on the ground, and the amounts of radionuclides taken into the body via the inhalation of air and ingestion of meat, milk, and vegetables. A Gaussian plume model was used to predict the atmospheric dispersion of radionuclides released from multiple stacks or area sources. The amounts of radionuclides that are inhaled were calculated from the predicted air concentrations and a user-specified breathing rate. The amounts of radionuclides in the meat, milk, and vegetables that people ingest were calculated by coupling the atmospheric transport models with models that predict the concentration in the terrestrial food chain.

RADRISK computed dose rates to organs resulting from a given quantity of radionuclide that is ingested or inhaled. Those dose rates were then used to calculate the risk of fatal cancers in an exposed cohort of 100,000 persons. All persons in the cohort were assumed to be born at the same time and to be at risk of dying from competing causes (including natural background radiation). RADRISK tabulated estimates of potential health risk due to exposure to a known quantity of approximately 500 different radionuclides and stored these estimates until needed. These risks were summarized in terms of the probability of premature death for a member of the cohort due to a given quantity of each radionuclide that is ingested or inhaled.

DARTAB provided estimates of the impact of radionuclide emissions from a specific facility by combining the information on the amounts of radionuclides that were ingested or inhaled (as provided by AIRDOS-EPA) with dosimetric and health effects data for a given quantity of each radionuclide (as provided by RADRISK). The DARTAB code calculated dose and risk for individuals at user-selected locations and for the population within an 80-km radius of the source. Radiation doses and risks could be broken down by radionuclide, exposure pathway, and organ.

Of the 11 conventional mills that were operating or in standby at that time, seven had unlined impoundments (the impoundments were clay lined, but not equipped with synthetic liners), while five had impoundments with synthetic liners. As the NESHAP revoked the exemption to the liner requirement of 40 CFR 192.32(a), the mills with unlined impoundments had to close the

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[2] "Standby" means the period of time when a facility may not be accepting new tailings but has not yet entered closure operations.

impoundments and move towards final reclamation and long-term stabilization of the tailings impoundments.

2.3.1 Existing Impoundments

The NESHAP for operating uranium mill tailings addressed both existing and future tailings impoundments. For the existing impoundments, the radon emissions and estimated risks were developed using site-specific data for each of the 11 mills that were operating or in standby at the time the assessment was made. These data included the average Ra-226 content of the tailings, the overall dimensions and areas of the impoundments (developed from licensing data and aerial photographs), areas of dry (unsaturated) tailings, the existing populations within 5 km of the centers of the impoundments (identified by field enumeration), 5–80 km populations derived from U.S. Census tract data, meteorological data (joint frequency distributions) from nearby weather stations, mixing heights, and annual precipitation rates.

The AIRDOS-EPA code was used to estimate airborne concentrations based on the calculated Rn-222 source term for each facility. Rn-222 source terms were estimated on the assumption that an Rn-222 flux of 1 pCi/(m^2-sec) results for each 1 picocurie per gram (pCi/g) of Ra-226 in the tailings and the areas of dried tailings at each site. The radon flux rate of 1 pCi/(m^2-sec) per pCi/g Ra-226 was derived based on theoretical radon diffusion equations and on the lack of available radon emissions measurements.

For each sector in the 0–80 km grid around each facility, the estimated Rn-222 airborne concentration was converted to cumulative working level months (WLMs), assuming a 0.50 equilibrium fraction between radon and its decay products, an average respiration rate appropriate for members of the general public, and the assumption of continuous exposure over a 70-year lifetime. Using a risk coefficient of 760 fatalities/10^6 WLM, lifetime risk, fatal cancers per year, and the risk distribution were calculated for the exposed population.

The baseline risk assessment for existing uranium tailings showed an MIR of 3×10^{-5} which was below the benchmark level of approximately 1×10^{-4} and is, therefore, presumptively safe. Additionally, the risk assessment calculated 0.0043 annual fatal cancers in the 2 million persons living within 80 km of the mills. The distribution of the cancer risk showed that 240 persons were at risks between 1×10^{-5} and 1×10^{-4}, and 60,000 were at risks between 1×10^{-6} and 1×10^{-5}. The remainder of the population of about 2 million was at a risk of less than 1×10^{-6}. Based on these findings, EPA concluded that baseline risks were acceptable.

The decision on an ample margin of safety considered all of the risk data presented above plus costs, scientific uncertainty, and the technical feasibility of control technology necessary to lower emissions from operating uranium mill tailings piles. As the risks from existing emissions were very low, EPA determined that an emission standard of 20 pCi/(m^2-sec), which represented current emissions, was all that was necessary to provide an ample margin of safety. The necessity for the standard was explained by the need to ensure that mills continued the current control practice of keeping tailings wet and/or covered. Finally, to ensure that ground water was not adversely affected by continued operation of existing piles that were not synthetically lined

or clay lined, the NESHAP ended the exemption to the requirements of 40 CFR 192.32(a), which protects water supplies from contamination.

2.3.2 New Impoundments

The 1989 risk assessment for new mill tailings impoundments was based on a set of model mills, defined so that the impact of alternative disposal strategies could be evaluated. For the purpose of estimating the risks, the model mills were characterized to reflect operating mills, and the dispersion modeling and population exposures were based on the arid conditions and sparse population density that characterize existing impoundments in the southwestern states.

For new impoundments, a baseline consisting of one large impoundment (116 acres, which is 80% wet or ponded during its 15-year active life) was modeled (i.e., the continuation of the current practice). The baseline results indicated an MIR of 1.6×10^{-4}, a fatal cancer incidence of 0.014 per year, and only 20 persons at a risk greater than 1×10^{-4}. Given the numerous uncertainties in establishing the parameters for the risk assessment and in modeling actual emissions and exposures, the Administrator found that the baseline emissions for new tailings impoundments met the criteria for presumptively safe.

The decision on an ample margin of safety for new tailings considered two alternatives to the baseline of one large impoundment: phased disposal using a series of small impoundments and continuous disposal. The evaluation of these alternatives showed a modest reduction in the MIR and the number of fatal cancers per year, but a significant increase in the number of individuals at a lifetime risk of less than 1×10^{-6}. The costs estimated for the two alternatives showed that phased disposal would lead to an incremental cost of $6.3 million, while continuous disposal was believed to actually result in a modest cost saving of $1 million.

Given the large uncertainties associated with the risk and economic assessments performed for the new tailings impoundments, and considering the boom and bust cycles that the uranium industry has experienced, EPA determined that a work practice standard was necessary to prevent the risks from increasing if an impoundment were allowed to become dry. Finally, although continuous disposal showed slightly lower overall risks and costs than phased disposal, the Administrator recognized that it was not a proven technology for disposal of uranium mills tailings. Therefore, he determined that the work practice standard should allow for either phased disposal (limited to 40-acre impoundments, with a maximum of two impoundments open at any one time) or continuous disposal.

3.0 THE URANIUM EXTRACTION INDUSTRY TODAY: A SUMMARY OF THE EXISTING AND PLANNED URANIUM RECOVERY PROJECTS

Section 3.1 describes the historical uranium market in the United States. In the 1950s and 1960s, the market was dominated by the U.S. government’s need for uranium, after which the commercial nuclear power industry began to control the market. The next three sections describe the types of process facilities that were and continue to be used to recover uranium. Section 3.2 describes conventional mills and includes descriptions of several existing mines, while Section 3.3 describes ISL facilities. Heap leach facilities are described in Section 3.4. Finally,

Section 3.5 discusses the applicability of the Subpart W recommended radon flux monitoring method.

3.1 The Uranium Market

The uranium recovery industry in the United States is primarily located in the arid southwest. From 1960 to the mid 1980s, there was considerable uranium production in the states of Colorado, Nebraska, New Mexico, South Dakota, Texas, Utah, Wyoming, and Washington. The majority of the uranium production at that time was associated with defense needs, while a lesser amount was associated with commercial power reactor needs. Without exception, the uranium recovery industry consisted of mines (open pit and underground) that were associated with conventional uranium milling operations. The conventional uranium mining/milling process is described in Section 3.2.

When the demand for uranium could not support the existing number of uranium recovery operations, there was a movement to decommission and reclaim much of the uranium recovery industry in the United States.

The UMTRCA Title I program established a joint federal/state-funded program for remedial action at abandoned mill tailings sites where tailings resulted largely from production of uranium for the weapons program. Now there is Federal ownership of the tailings disposal sites under general license from the Nuclear Regulatory Commission (NRC). Under Title I, the Department of Energy (DOE) is responsible for cleanup and remediation of these abandoned sites. The NRC is required to evaluate DOE's design and implementation and, after remediation, concur that the sites meet standards set by EPA.

The UMTRCA Title II program is directed toward uranium mill sites licensed by the NRC or Agreement States in or after 1978. Title II of the act provides –

- NRC authority to control radiological and nonradiological hazards.
- EPA authority to set generally applicable standards for both radiological and nonradiological hazards.
- Eventual state or federal ownership of the disposal sites, under general license from NRC.[3]

In the mid- to late 1980s, several commercial uranium recovery projects employing the solution, or ISL, mining process came on line. Section 3.3 describes the uranium ISL mining process. The uranium ISL projects and the data that they collected served as the industry standard. This industry saw an increase in activity as the conventional mine/milling operations were being shut down.

This shift in the method of uranium mining was associated with economic conditions that existed at the time. The price of uranium rapidly declined in the 1980s. The decline in price was associated with overproduction that took place during the earlier years. The peak in production was associated with Cold War production and associated contracts with DOE. However, as the

[3] http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/mill-tailings.html

Cold War came to an end, the need for uranium began to diminish. The amount of uranium that was needed for DOE projects was greatly diminished and, therefore, the price of uranium saw a decline. Figure 1 shows the spot prices for natural uranium. Note the price decline in the early 1980s.

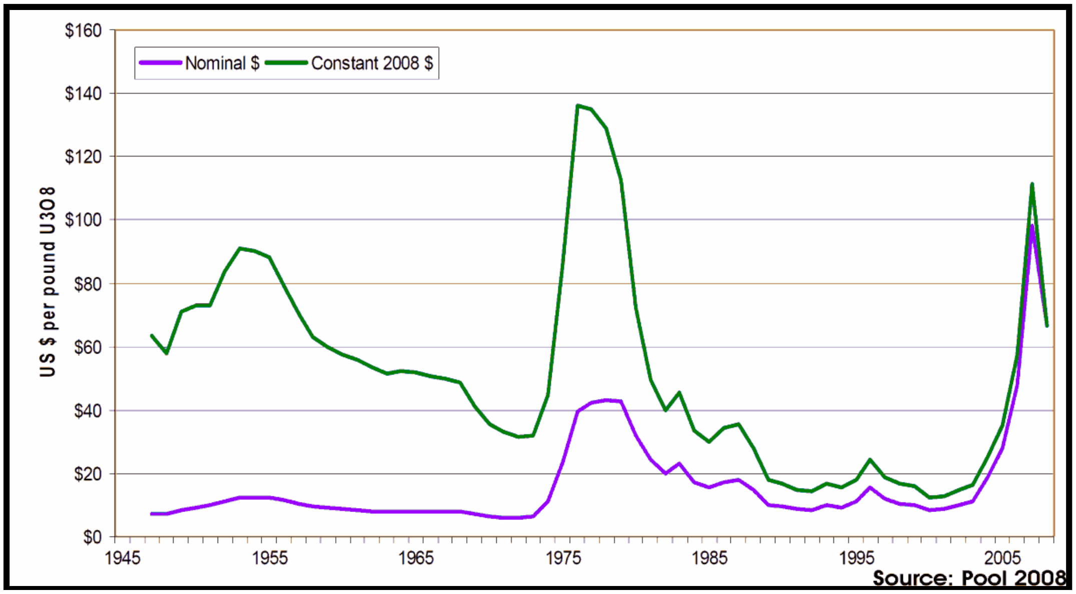
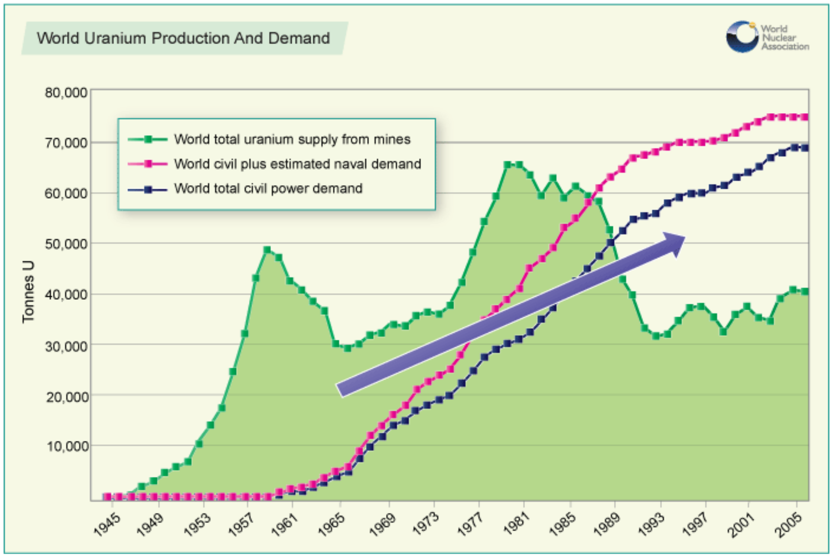


Figure 1: Historical Uranium Prices

Additionally, inexpensive uranium appeared on the worldwide market associated with the foreign supplies of low-grade and rather impure yellowcake. Only minimal purification and associated refinement was necessary to produce a yellowcake feedstock that could supply domestic and worldwide uranium needs from the low-grade foreign supply. Finally, the megatons to megawatts downblending program also supplied large supplies of uranium, both domestically and worldwide. Classical supply and demand economic principles established a market that had oversupply, constant demand and, therefore, a declining price. Consequently, the uranium industry in the United States saw a production decline. Although the number of uranium operations and production of domestic supply of uranium declined, several domestic uranium projects remained active, primarily supplying foreign uranium needs. These projects were generally located in the ISL mining production states of Nebraska, Texas, and Wyoming. This represented a significant shift in the method that was used to recover uranium, from conventional mines to ISL mines.

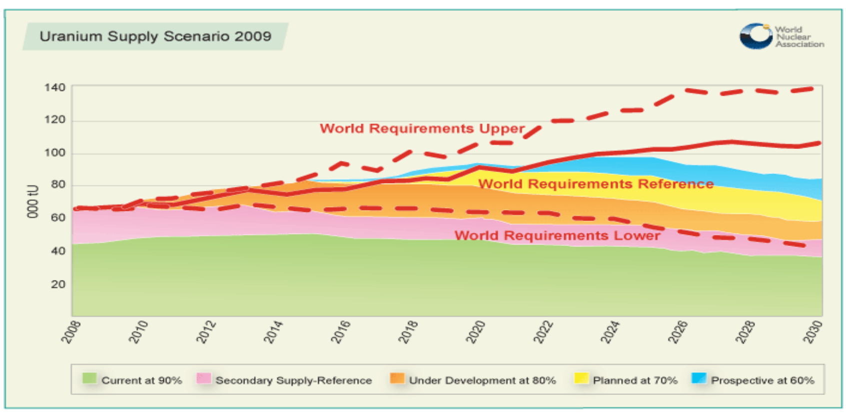
Numerous forecasts of worldwide uranium supply and demand exist. Perhaps one of the best graphical representations is from the World Nuclear Association. Figure 2 shows the actual uranium production rates from 1945 to 2005, as well as the demand trend that was established based on these production numbers. Figure 2 indicates that, from the 1960s to the present, the worldwide uranium demand has continued to increase even though the U.S. price for uranium has decreased.



Source: WNA 2010

Figure 2: Uranium Production and Demand from 1945 to 2005

Figure 3 shows the uranium supply scenario forecast by the World Nuclear Association. The three potential requirement curves shown are based on a variety of factors. The figure indicates that current production, as well as planned future worldwide production, may begin to fall short of demand in the next few years.



Source: WNA 2010

Figure 3: Uranium Supply Scenario from 2008 to 2030

In summary, all forecasts are for the uranium industry to show growth in the next decade and continuing for the foreseeable future. Drivers for this trend are a worldwide need for clean energy resources, the current trend to develop domestic sources of energy, and the investment of foreign capital in the United States, which is recognized as a politically and economically stable market in which to conduct business.

3.2 Conventional Uranium Mining and Milling Operations

Conventional uranium mining and milling facilities are one of two types of uranium recovery facilities that currently possess state or federal licenses to operate. There are currently no licensed heap leach facilities. Conventional uranium mining and milling operations are in the minority and are a carryover from the heavy production days of the 1970s and 1980s. Sweetwater Mill, Shootaring Canyon Mill, and White Mesa Mill represent the extent of the current conventional uranium milling operations that exist in the United States.

A conventional uranium mill is generally defined as a chemical plant that extracts uranium using the following process:

(1) Trucks deliver uranium ore to the mill, where it is crushed into smaller particles before the uranium is extracted (or leached). In most cases, sulfuric acid (H_2SO_4) is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. In addition to extracting 90–95% of the uranium from the ore, the leaching agent also extracts several other "heavy metal" constituents, including molybdenum, vanadium, selenium, iron, lead, and arsenic.

(2) The mill then concentrates the extracted uranium to produce a material called "yellowcake" because of its yellowish color.

(3) Finally, the yellowcake is transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 4 shows a schematic of a typical conventional uranium mill.

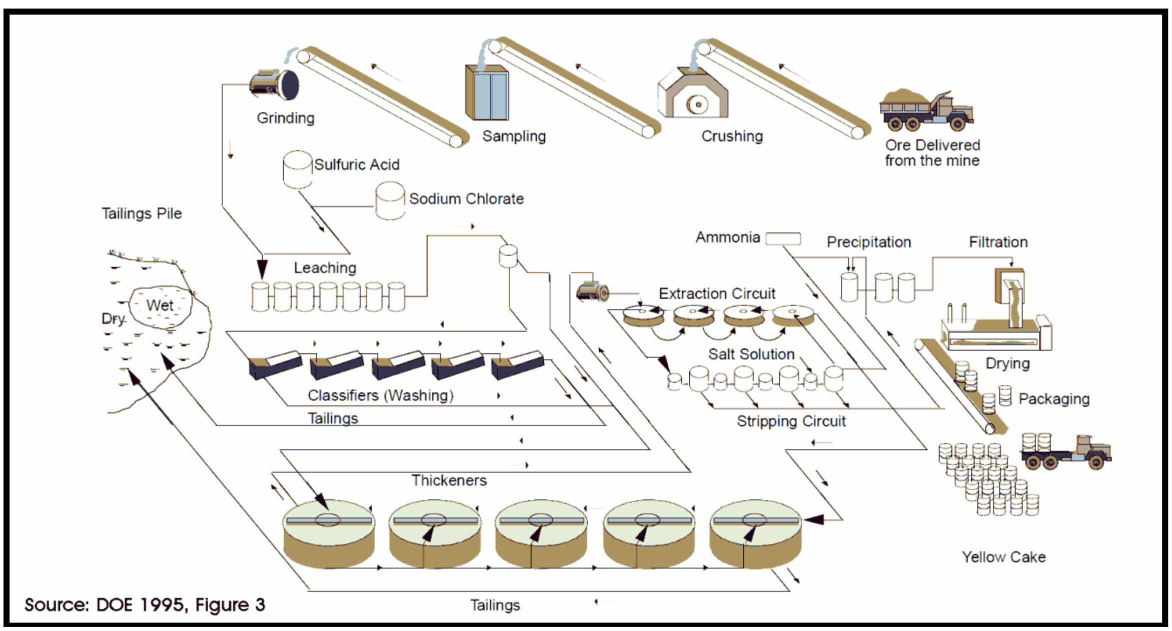


Figure 4: Typical Conventional Uranium Mill

Currently, there are three domestic licensed conventional uranium mining and milling facilities and a newly licensed facility that has yet to be constructed, as shown in Table 3.

Table 3: Conventional Uranium Mining and Milling Operations

Mill Name	Licensee	Location	Website
Sweetwater	Kennecott Uranium Co/Wyoming Coal Resource Co	Sweetwater County, Wyoming	None identified
Shootaring Canyon	Uranium One Americas	Garfield County, Utah	http://www.uranium1.com/indexu.php?section=home
White Mesa	EFR White Mesa LLC	San Juan County, Utah	http://www.energyfuels.com/white_mesa_mill/
Piñon Ridge	Energy Fuels Resources Corp.	Montrose County, Colorado	http://www.energyfuels.com/projects/pinon-ridge/index.html
Mill Name	**Regulatory Status**		**Capacity (tons/day)**
Sweetwater	Standby,* license expires November 2014		3,000
Shootaring Canyon	Standby,* license expires May 2012		750
White Mesa	Operating, license expires March 2015		2,000
Piñon Ridge	Development, license issued January 2011		500 (design)

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

Instead of processing uranium ore, the conventional mills shown in Table 3 may process alternate feed stocks. These feed stocks are generally not typical ore, but rather materials that contain recoverable amounts of radionuclides, rare earths, and other strategic metals. These feed stocks are processed, the target materials are recovered, and the waste tailings are discharged to the tailings impoundment. The two facilities shown in Table 3 as being in standby (Sweetwater and Shootaring Canyon) have had their operating licenses converted into "possession only" licenses. Prior to recommencing operation, those facilities will be required to submit a license application to convert back to an operating license. EPA will review that portion of the license application associated with NESHAP to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures.

As described in Section 3.1, the rapid rise in energy costs, increased concerns about global warming, and the tremendous worldwide surge in energy use have all led to renewed interest in uranium as an energy resource. At the spring 2010 joint National Mining Association (NMA)/ NRC Uranium Recovery Workshop, the NRC identified numerous projects that have filed or are expected to file applications for new licenses, expansions of existing operations, or restarts of existing operations, including several proposals for conventional uranium recovery facilities. Contacts with the NRC and state regulatory agencies indicate that permitting and licensing actions are associated with the proposed conventional uranium milling and processing projects shown in Table 4. Although a significant uranium producer, at present, Texas has no interest in conventional uranium milling operations. The potential new mill at Piñon Ridge, Colorado, is not shown in Table 4, since its development is advanced and it has already been listed in Table 3.

Table 4: Proposed New Conventional Uranium Milling Facilities

Company	Site	(Estimated) Application Date	State
Uranium Energy Corp	Anderson Project	N.A.	AZ
Rio Grande Resources	Mt. Taylor	FY14	NM
Strathmore Minerals Corporation	Roca Honda	12-Sep	NM
Uranium Resources, Inc.	Juan Tafoya	FY 14	NM
Oregon Energy, LLC	Aurora Uranium Project	13-Dec	OR
Virginia Uranium	Coles Hills	N.A.	VA
Strathmore Minerals Corporation	Gas Hills	12-Sep	WY

N.A. = not available

No new construction has taken place on any milling facilities shown in Table 4; however, as with all industries, planning precedes construction. Considerable planning is underway for existing and new uranium recovery operations. As with facilities currently in standby, EPA will review the license application to ensure that all Subpart W requirements are incorporated into the appropriate licensing documents and operating procedures for these proposed new mills.

No specific information is available on the type of tailings management systems intended for the proposed new conventional mills. To limit radon that could be emitted from the tailings impoundments, Subpart W requires that the tailings be disposed of in a phased disposal system with disposal cells not larger than 40 acres, or by continuous disposal in which not more than 10 acres of exposed tailings may accumulate at any time. Regardless of the type of tailings management system the new milling operations select, they will all also have to demonstrate that their proposed tailings impoundment systems meet the requirements in 40 CFR 192.32(a)(1).

3.2.1 Sweetwater Mill, Kennecott Mining Company, Red Desert, Wyoming

The Sweetwater project is a conventional uranium recovery facility located about 42 mi northwest of Rawlins, Wyoming, in Sweetwater County. The site is very remote and located in the middle of the Red Desert. The approximately 1,432-acre site includes an ore pad, overburden pile, and the milling area (see Figure 5). The milling area consists of administrative buildings, the uranium mill building, a solvent extraction facility, and a maintenance shop. There is also a 60-acre tailings management area with a 37-acre tailings impoundment that contains approximately 2.5 million tons of tailings material. The Sweetwater impoundments are synthetically lined, as required in 40 CFR 192.32(a). The facility is in a standby status and has a possession only license administered by the NRC. The future plans associated with this facility are unknown, but the facility has been well maintained and is capable of processing uranium. The standby license for this facility is scheduled to expire in 2014. The licensee and/or regulator will decide whether to renew or to terminate this license.

Figure 5: Sweetwater – Aerial View

To demonstrate compliance with Subpart W, testing on the facility's tailings impoundment for radon emissions is conducted annually (KUC 2011). Table 5 shows the results of that testing. The lower flux readings measured in 2009 and 2010 are a direct result of the remediation work (regrading and lagoon construction in the tailings impoundment) performed in 2007 and 2008.

Table 5: Sweetwater Mill Radon Flux Testing Results

Test Date	Radon Flux (pCi/(m^2-sec))	Test Date	Radon Flux (pCi/(m^2-sec))
August 7, 1990	9.0	August 14, 2001	6.98
August 13, 1999	5.1	August 13, 2002	4.10
August 5, 1992	5.6	August 12, 2003	7.11
August 24, 1993	5.0	August 17, 2004	6.38
August 23, 1994	5.0	August 16, 2005	7.63
August 15, 1995	3.59	August 15, 2006	3.37
August 13, 1996	5.47	August 13, 2007	6.01
August 26, 1997	4.23	August 5, 2008	4.59
August 11, 1998	2.66	July 30, 2009	1.60
August 10, 1999	1.27	August 10, 2010	1.44
August 8, 2000	4.05		

Source: KUC 2011, p. 6

Summary of Results

Air monitoring data were reviewed for a 26-year period (1981 to 2007). Upwind Rn-222 measurements, as well as downwind Rn-222 values, were available. The average upwind radon value for the period of record was 3.14 picocuries per liter (pCi/L). The average downwind radon value for the same period was 2.60 pCi/L. These values indicate that there is no measurable contribution to the radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility.

Approximately 28.3 acres of tailings are dry with an earthen cover; the remainder of the tailings is continuously covered with water. The earthen cover is maintained as needed. One hundred radon flux measurements were taken on the exposed tailings, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed beaches was 8.5 pCi/(m^2-sec). The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/(m^2-sec). The calculated radon flux from the entire tailings impoundment surface is approximately 30% of the 20.0 pCi/(m^2-sec) standard.

3.2.2 White Mesa Mill, Energy Fuels Corporation, Blanding, Utah

The White Mesa project is a conventional uranium recovery facility located about 6 mi south of Blanding, Utah, in San Juan County. The approximately 5,415-acre site includes an ore pad, overburden pile, and the milling area (see Figure 6). The mill area occupies approximately 50 acres and consists of administrative buildings, the uranium milling building, and ancillary facilities. The facility used a phased disposal impoundment system, and two of the 40-acre cells are open. The facility has operated intermittently in the past, and this type of operation continues on a limited basis. The amount of milling that takes place, as well as the amount of uranium that is being produced, is a small fraction of the milling capacity. The uranium recovery project has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control.

Figure 6: White Mesa – Aerial View

To demonstrate compliance with Subpart W, the radon flux from tailings surfaces is measured and reported to the State of Utah annually. As Table 6 shows, these data consistently demonstrate that the radon flux from the White Mesa Mill's tailings cells are below the criteria.

Table 6: White Mesa Mill's Annual Radon Flux Testing, Tailings Cells 2 & 3

Year	Radon Flux (pCi/(m^2-sec))	
	Cell 2	Cell 3
1997	12.1	16.8
1998	14.3	14.9
1999	13.3	12.2
2000	9.3	10.1
2001	19.4	10.7
2002	19.3	16.3
2003	14.9	13.6
2004	13.9	10.8
2005	7.1	6.2

Source: Denison 2007, p. 116

The Table 6 radon flux values for 2001 and 2002 were elevated when compared to the prior years. Denison believes that these radon fluxes were largely due to the drought conditions in those years, which reduced the moisture content in the interim cover placed over the inactive portions of tailings Cells 2 and 3. In addition, the beginning of the 2002 mill run, which resulted in increased activities on the tailings cells, may have contributed to these higher values. As a result of the higher radon fluxes during 2001 and 2002, additional interim cover was placed on

the inactive portions of Cells 2 and 3. While this effort was successful, additional cover was applied again in 2005 to further reduce the radon flux (Denison 2007).

Summary of Results

Air monitoring data were reviewed for a 2-year period (2006 to 2008). The White Mesa site utilized the MILDOS code to calculate radon concentrations (ANL 1998), in the same calculation process that had been used since 1995. As a comparison, Denison Mines reactivated the six air monitoring stations that were used at the site. Data from these stations were collected for a 2-year period. The upwind and downwind measurements showed no definable trends. At times, the upwind concentrations were the higher values, while at other times, the downwind concentrations were the greatest. However, all values were within regulatory standards.

The tailings facilities at the White Mesa facility consist of the following impoundments/cells (Denison 2011):

- Cell 1, constructed with a 30-millimeter (mil) PVC earthen-covered liner, is used for the evaporation of process solution (Cell 1 was previously referred to as Cell 1-I, but is now referred to as Cell 1).

- Cell 2, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands. Cell 2 has 67 acres of surface area. Because 99% of the cell has a soil cover over the deposited tailings, only 0.7 acres of tailings are exposed as tailings beaches.

- Cell 3, constructed with a 30-mil PVC earthen-covered liner, is used for the storage of barren tailings sands and solutions. Cell 3 has 71 acres of surface area, and 54% of the cell has a soil cover over the deposited tailings. The remainder of the cell consists of tailings beaches (19%) and standing liquid (26%).

- Cell 4A, constructed with a geosynthetic clay liner, a 60-mil high-density polyethylene (HDPE) liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in October 2008.

- Cell 4B, constructed with a geosynthetic clay liner, a 60-mil HDPE liner, a 300-mil HDPE Geonet drainage layer, a second 60-mil HDPE liner, and a slimes drain network over the entire cell bottom. This cell was placed into service in February 2011.

One hundred radon flux measurements were collected on the Cell 2 beach area, and an additional 100 measurements were taken on the soil-covered area in accordance with Method 115 for Subpart W analysis. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The average radon flux for all of Cell 2 was calculated to be 13.5 pCi/(m^2-sec), or about 68% of the 20.0 pCi/(m^2-sec) standard.

At Cell 3, 100 radon flux measurements were collected from each of the soil cover and the beach areas, as required by Method 115. The data were used to calculate the mean radon flux for the exposed beaches and the soil-covered area. The radon flux from the standing liquid-covered area was assumed to be zero. The average radon flux for all of Cell 3 was calculated to be 8.9 pCi/(m^2-sec), or about 46% of the 20.0 pCi/(m^2-sec) standard.

3.2.3 Shootaring Canyon Mill, Uranium One Incorporated, Garfield County, Utah

The Shootaring Canyon project is a conventional uranium recovery facility located about 3 mi north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings management system that is partially constructed (see Figure 7). The mill circuit operated for a very short time and generated only enough tailings to cover 7 acres of the impoundment. Although the milling circuit has been dismantled and sold, the facility is in a standby status and has a possession only license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company. The standby license for this facility is scheduled to expire in 2014. The licensee and/or the regulator will decide whether to renew or to terminate this license.

Figure 7: Shootaring Canyon – Aerial View

Summary of Results

Air monitoring data were reviewed for a 2-year period (2009 to 2010). Continuous air monitoring is not conducted at the site; rather, a 20- to 24-hour sampling event is required once per quarter as a condition of the license. The high-volume air sampler is located downwind of the tailings facility. Many sampling events during a 2-year period indicate that the downwind

Rn-222 concentrations are around 1% of the allowable effluent concentration limit. The two years of data reviewed indicated no trends.

The Shootaring Canyon facility operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in an area of 2,508 m^2 (0.62 acres). The tailings are dry except for moisture-associated occasional precipitation events; consequently, there are no beaches. The tailings have a soil cover that is maintained by the operating company. The impoundment at Shootaring Canyon is synthetically lined, as required in 40 CFR 192.32(a).

One hundred radon flux measurements were collected on the soil-covered tailings area in accordance with Method 115. The 2009 sampling results indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), which exceeded the allowable 20 pCi/(m^2-sec) regulatory limit. In response to this result, the licensee notified the Utah Division of Radiation Control and placed additional soil cover on the tailings. The soil cover consisted of local borrow materials in the amount of 650 cubic yards. More sampling took place during the week of November 7, 2009. An additional 100 sample results were collected and showed that the average radon flux was reduced to 18.1 pCi/(m^2-sec). Sampling for 2010 took place in April. Again, 100 radon flux measurements were collected. The average radon flux revealed by this sampling was 11.9 pCi/(m^2-sec).

3.2.4 Piñon Ridge Mill, Bedrock, Colorado

The Piñon Ridge project is a permitted conventional uranium recovery facility in development. The permitted location is located about 7 mi east of Bedrock, Colorado, and 12 mi west of Naturita, Colorado, in Montrose County (see Figure 8). The approximately 1,000-acre site will include an administration building, a 17-acre mill site, a tailings management area with impoundments totaling approximately 90 acres, a 40-acre evaporation pond with proposed expansion of an additional 40-acre evaporation pond as needed, a 6-acre ore storage area, and numerous access roads. The design of the tailings management area is such that it can meet the work practice standard with a synthetically lined impoundment, a leak detection system, and a surface area that does not exceed 40 acres. The facility has not been constructed, but is fully licensed and administered by the Colorado Department of Public Health and Environment. Also, EPA has approved the facility's license to construct under NESHAP Subpart A of 40 CFR 61. Current activities at the site are maintenance of pre-operational environmental monitoring.

Figure 8: Piñon Ridge – Aerial View

3.2.5 Conventional Mill Tailings Impoundments and Radon Flux Values

In summary, the radon data for the active mill tailings impoundments indicate that the radon exhalation rates from the measured surfaces have exceeded the regulatory standard of 20 pCi/(m^2-sec) at times. Two instances exist in the records that were reviewed. One instance was in 2007, when a portion of the Cotter Corporation impoundment did not have sufficient soil cover. Monitoring results showed a flux rate of 23.4 pCi/(m^2-sec). The tailings surface was covered with a soil mixture, and the flux rate was reduced to 14.0 pCi/(m^2-sec). The second instance in which the regulatory standard was exceeded was recorded during the 2009 sampling event at Shootaring Canyon Mill. This sampling event indicated that average flux from the covered tailings was 23.3 pCi/(m^2-sec), caused by insufficient soil cover. Although covering tailings piles with various other materials (e.g., synthetics, asphalt, soil-cement mixtures) has been studied, covers made of earth or soil have been shown to be the most cost effective in reducing radon emissions (EPA 1989, NRC 2010). In both cases when monitoring indicated radon fluxes in excess of the standard, additional soil cover was added to the tailings, and the radon flux rates were reduced to below the regulatory standards.

Table 8 shows the average/calculated radon flux values, as reported by the uranium recovery operators.

Table 7: Mill Tailings Impoundments and Average/Calculated Radon Flux Values*

Facility	Radon Flux (pCi/(m^2-sec))		Calculated Tailings Impoundment Average Radon Flux (pCi/(m^2-sec))
	Soil-Covered Area	Tailings Beach	
Sweetwater Mill	No soil-covered area	8.5	6.01
White Mesa Mill, Cell 2	13.1	50.2	13.5
White Mesa Mill, Cell 3	13.9	6.7	8.9
Shootaring Canyon Mill	15 2-year average	Not applicable	15 2-year average
Piñon Ridge Mill	Not applicable	Not applicable	Not applicable

* The respective uranium recovery operators supplied all data and calculations.

3.3 In-Situ Leach Uranium Recovery (Solution Mining)

Solution, ISL or in-situ recovery (ISR), mining is defined as the leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface (IAEA 2005). Leaching, or more correctly the remobilization of uranium into solution, is accomplished through the injection into the ore body of a lixiviant. The injection of a lixiviant essentially reverses the geochemical reactions associated with the uranium deposit. The lixiviant ensures that the dissolved uranium, as well as other metals, remains in solution while it is collected from the mining zone by recovery wells.

ISL mining was first conducted in Wyoming in 1963. The research and development projects and associated pilot projects of the 1980s demonstrated solution mining as a viable uranium recovery technique. Initial efforts at the solution mining process were often less than ideal:

- Lixiviant injection was difficult to control, primarily because of poor well installation.
- Laboratory-scale calculations did not always perform as suspected in geological formations.
- Recovery well spacing was poorly understood, causing mobilized solutions to migrate in unsuspected pathways.
- Restoration efforts were not always effective in re-establishing reducing conditions; therefore, some metals remained in solution and pre-mining ground water conditions were not always achievable.

Additional research and development work indicated that mining solutions could be controlled with careful well installation. The use of reducing agents during restoration greatly decreased the amount of metals that were in solution. As a result of these modifications in mining methods, solution mining of uranium became a viable method to recover some uranium deposits, many of which could not be economically mined by the open pit methods typically employed by the uranium industry. Additionally, the economics of solution mining were more favorable than conventional mining and milling. Because of these factors, solution mining and associated processing began to dominate the uranium recovery industry. Figure 10 shows a schematic of a typical ISL uranium recovery facility.

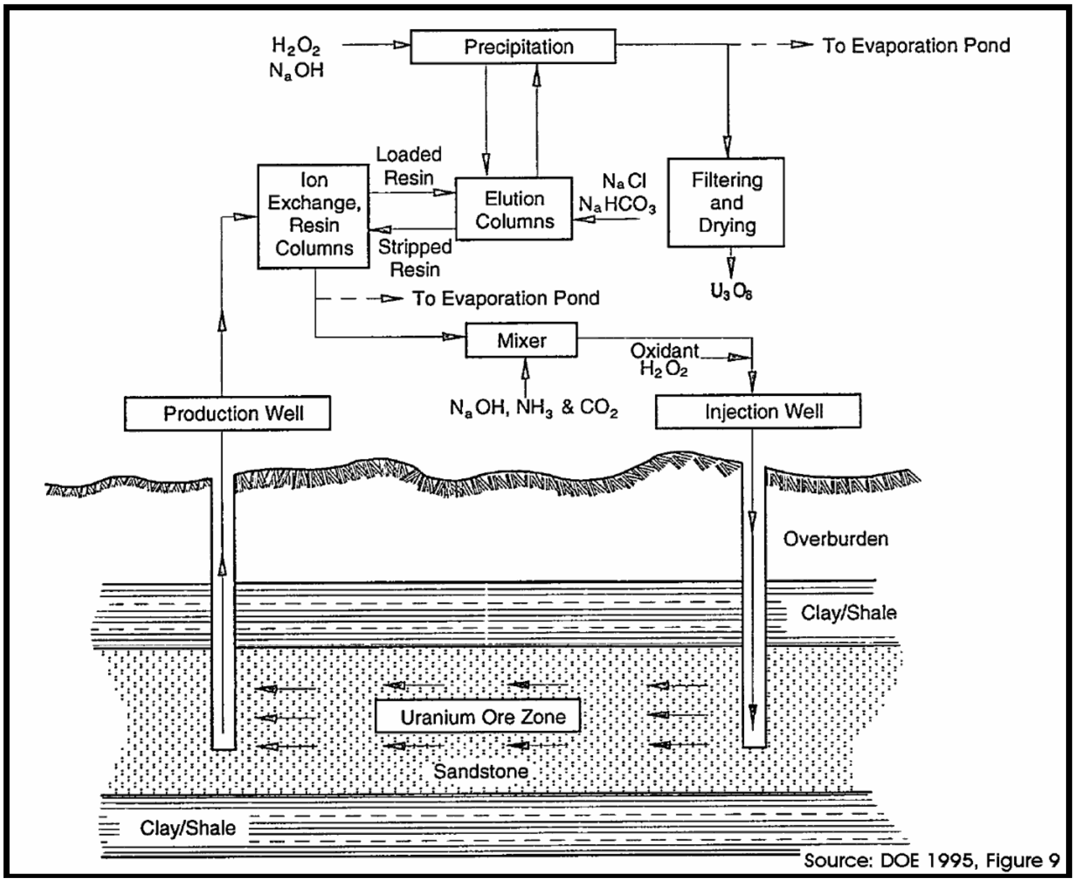


Figure 9: In-Situ Leach Uranium Recovery Flow Diagram

During typical solution mining, a portion of the lixiviant is bled off in order to control the pressure gradient within the wellfield. As Figure 10 shows, the liquid bled from the lixiviant is sent to an evaporation pond, or impoundment. The pond/impoundment may be used to dispose of the liquid via evaporation, or it may be used simply to hold the liquid until a sufficient amount has been accumulated so that other means may be used to dispose of it (e.g., land application or irrigation, deep well disposal). Since Ra-226 is present in the water bled from the lixiviant, radon will be generated in and released from the solution mining facility's evaporation/holding ponds or impoundments.

The 1989 NESHAP risk assessment (EPA 1989), although not conducted specifically for solution mining sites, is applicable to ponds/impoundments at solution mining facilities. All of the ponds at solution mining facilities are synthetically lined. Because of the presence of liners, none would be required to be closed. The solution mining industry is more transient in that the impoundment life is less than those at conventional uranium mining and milling sites. Typically, the impoundments are in the range of 1–4 acres and are built to state-of-the-art standards.

Two types of lixiviant solutions, loosely defined as acid or alkaline systems, can be used. In the United States, the geology and geochemistry of most uranium ore bodies favor the use of "alkaline" lixiviants or bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of

the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground water restoration. The acid systems once used in the United States are still used in Eastern Europe and Asia and were used recently in Australia on ore bodies in saline aquifers (IAEA 2005).

The four major types of uranium deposits in the United States are: strata-bound (roll front), solution breccia pipe, vein, and phosphatic deposits (EPA 1995). Of these, ISL is the uranium recovery technique used mostly on strata-bound ore deposits. Strata-bound ore deposits are ore deposits contained within a single layer of sedimentary rock. They account for more than 90% of the recoverable uranium and vanadium in the United States and are found in three major geographic areas: the Wyoming Basin (Wyoming and Nebraska), Colorado Plateau or Four Corners area (northwestern New Mexico, western Colorado, eastern Utah, and northeastern Arizona), and southern Texas. A discussion of the origin of the uranium ore, including ore body formation and geochemistry, may be found in the reference, *Technical Resource Document Extraction and Beneficiation of Ores and Minerals*, Volume 5, "Uranium" (EPA 1995). Much of the recoverable uranium in these regions lends itself to ISL because of the physical and geochemical properties of the ore bodies.

Four times a year, the Energy Information Administration (EIA) publishes data on the status of U.S. ISL facilities. EIA (2013) identified six ISL facilities that were recovering uranium and producing yellowcake in the 2nd quarter of 2013. Table 8 shows these facilities. These operations are located in NRC-regulated areas, as well as in Agreement States.

Table 8: Operating ISL Facilities

Plant Owner	Plant Name	County, State
Cameco	Crow Butte Operation	Dawes, Nebraska
Power Resources, Inc. dba Cameco Resources	Smith Ranch-Highland Operation	Converse, Wyoming
Uranium Energy Corp. dba South Texas Mining Venture	Hobson ISR Plant	Karnes, Texas
	La Palangana	Duval, Texas
Mestena Uranium LLC	Alta Mesa Project	Brooks, Texas
Uranium One USA, Inc.	Willow Creek Project (Christensen Ranch and Irigaray)	Campbell and Johnson, Wyoming

The two major geographical areas of ISL mining and processing have been Texas and Wyoming. These areas are well suited to this ISL mining technology, in that the geology associated with the mineralized zone is contained by layers of impervious strata. Texas is the major producer of uranium from ISL operations, followed by Wyoming. ISL operations in South Dakota and Nebraska recover lesser amounts of uranium.

For the 2nd quarter of 2013, EIA (2013) identified the ISL facilities shown in Table 9 as being developed, or partially or fully permitted and licensed, or under construction. As discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining actions.

As the data in Table 9 show, there is considerable interest in ISL mining operations in the U.S. uranium belt. Many of the existing ISL operations are planning for expansion by preparing the license applications and other permitting documents. It is apparent that most domestic uranium recovery will be associated with existing and new ISL operations.

Table 9: ISL Facilities That Are Restarting, Expanding, or Planning for New Operations

Plant Owner	**Plant Name**	**County, State (existing and *planned* locations)**	**Status, 2nd Quarter 2013**
Powertech Uranium Corp	Dewey Burdock Project	*Fall River and Custer, South Dakota*	Developing
Uranium One Americas, Inc.	Jab and Antelope	*Sweetwater, Wyoming*	Developing
Hydro Resources, Inc.	Church Rock	*McKinley, New Mexico*	Partially Permitted And Licensed
Hydro Resources, Inc.	Crownpoint	*McKinley, New Mexico*	Partially Permitted And Licensed
Strata Energy Inc	Ross	*Crook, Wyoming*	Partially Permitted And Licensed
Uranium Energy Corp.	Goliad ISR Uranium Project	*Goliad, Texas*	Permitted And Licensed
Uranium One Americas, Inc.	Moore Ranch	*Campbell, Wyoming*	Permitted And Licensed
Lost Creek ISR, LLC	Lost Creek Project	Sweetwater, Wyoming	Under Construction
Uranerz Energy Corporation	Nichols Ranch ISR Project	Johnson and Campbell, Wyoming	Under Construction

Table 10 shows the size of the surface impoundments at ISL facilities. It is noteworthy that the operation of these facilities does not require impoundments nearly as large as the impoundments used at conventional mills. The impoundments are utilized for the evaporative management of waste water. The impoundments are small because a minimal percentage of the process water needs to be over-recovered to maintain solution flow to the recovery wells. The solution mining industry has used deep well injection for most of the waste water. All signs indicate that this type of waste water disposal will continue in the future.

Table 10 shows that all of the solution mining sites reviewed are using the deep well injection method.

Table 10: ISL Evaporation Pond Data Compilation

Operation	Evaporation pond?	Date pond was constructed	Size of pond	Synthetic liner under pond?	Leak detection system?	Deep well injection?
Cameco, Smith Ranch	East and west ponds	1986	8.6 acres	Yes	Yes, ponds have had leaks	Yes, used for most waste water, started in 1999
Cameco, Crow Butte	3 commercial ponds and 2 R&D ponds	R&D ponds 1990	Pond 1, 2, 5 850×200 ft Pond 3, 4 700×250 ft	Yes	Yes	Yes, all bleed stream
Hydro Resources, Crown Point	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Hydro Resources, Church Rock	Project is licensed with the NRC, but no construction has taken place (personal conversation with Uranium Resources personnel)					
Uranium Resources Inc., Kingsville Dome	Two 120×120 ft ponds	1990	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Vasquez	Two 150×150 ft ponds	1990	150×150 ft	Yes	Yes	Yes, @ 200 gpm
Uranium Resources Inc., Rosita	Two 120×120 ft ponds	1985	120×120 ft	Yes	Yes	Yes, @ 200 gpm
Mestena, Alta Mesa	Evaporation data not found					
STMV, La Palangana	Evaporation data not found					

3.3.1 Radon Emission from Evaporation and/or Holding Ponds

Unlike conventional mills, ISL facilities do not produce tailings or other solid waste products. However, they do generate significant amounts of liquid wastes during uranium extraction and aquifer restoration. During extraction, an extraction solution (lixiviant), composed of ground water enhanced by an oxidant and carbonate/bicarbonate, is injected through wells into the ore zone. This lixiviant moves through pores in the ore body and mobilizes the uranium. The resulting "pregnant" lixiviant is withdrawn by production wells and pumped to the processing plant, which recovers the uranium. To prevent leakage of the lixiviant outside the production zone, it is necessary to maintain a hydraulic cone of depression around the well field. This is accomplished by bleeding off a portion of the process flow. Other liquid waste streams are from sand filter backwash, resin transfer wash, and plant washdown. One method to dispose of these liquid wastes is to evaporate them from ponds. Deep well injection and land application (i.e., irrigation) are other methods for disposing of the liquid wastes. For these disposal methods, the waste liquid is collected in holding ponds until a quantity sufficient for disposal has been accumulated.

As defined by the AEA of 1954, as amended, byproduct material includes tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content (42 USC 2014(e)(2)). Clearly, waste water generated during solution mining is within this definition of byproduct material and is thus subject to the requirements of Subpart W.

The waste water contains significant amounts of radium, which will radiologically decay and generate radon gas. Radon diffuses much more slowly in water than it does in air. For example, the radon diffusion coefficient in water is about 10,000 times smaller than the coefficient in air (i.e., on the order of 10^{-5} square centimeters per second (cm^2/sec) for water and 10^{-1} cm^2/sec for air (Drago 1998, as reported in Brown 2010)). Thus, if the tailings piles are covered with water, then most of the radon would decay before it could diffuse its way through the water. However, since over time periods comparable to the half-life of radon, there is considerable water movement within a pond, advective as well as diffusive transport of radon from the pond water to the atmosphere must be considered. The water movement is partly caused by surface wind currents, thermal gradients, mechanical disturbance from the mill discharge pipe, and biological disturbances (animals, birds, etc.). Dye movement tests indicate that for shallow (less than 1 meter) pond water, advective velocities may exceed 1–2 millimeters per minute, resulting in virtually no radon containment by the surface water. If shallow water movement is sufficient to remove radon from the tailings-water interface and transport it to the atmosphere in a short time (several hours), the radon flux from the shallow tailings is nearly as great as that from similar bare saturated tailings; hence, no significant radon attenuation is gained by covering the tailings with water (Nielson and Rogers 1986). Consequently, in order for a pond covering a tailings pile to be effective at reducing the release of radon, the pond water must be greater than 1 meter in depth.

Additionally, if there is radium in the pond water, radon produced from that radium could escape into the atmosphere. A review of the various models used for estimating radon flux from the

surface of water bodies indicates that the stagnant film model (also known as the two bottleneck model (Schwarzenbach et al. 2003)), coupled with a wind correction equation, can be used to estimate the radon flux based on the concentration of radium in the pond's water and the assumption that radon is in secular equilibrium with the radium. The radon flux from the surface of an evaporation pond, as a function of the wind speed (for winds less than 24 miles per hour (mph)), can be estimated using this model with the following equation:

$$J = \frac{1.48 \times 10^{-4}}{e^{-0.351V}} C_w \qquad (3\text{-}1)$$

Where	J	=	Radon flux	(pCi/(m^2-sec))
	C_w	=	Concentration of radium in the water	(pCi/L)
	V	=	Wind speed	(m/sec)

Implicit in this model is the fact that in pond water the radon diffusion coefficient is 10^{-5} cm^2/sec and that the thickness of the stagnant film layer can be estimated by an exponential relationship with wind speed (Schwarzenbach et al. 2003).

Baker and Cox (2010) measured the radium concentration in an evaporation pond at the Homestake Uranium Mill Site at 165 pCi/L. Assuming a direct conversion to Rn-222 (165 pCi/L), the flux is estimated from equation 3-1 at 1.65 pCi/(m^2-sec). This is comparable to measurements of the flux, which averaged 1.13 pCi/(m^2-sec). However, the Homestake measurement method did not allow the measurement of wind-generated radon fluxes, as the collar used to float the canister makes the wind speed zero above the area being measured. No data were found for measurements of the radon flux on evaporation ponds versus wind speed.

The model should not be used for wind speeds above 10 meters per second (m/sec) (24 mph). However, this is not expected to be a major limitation for estimating normal radon releases and impacts from operational evaporation ponds.

Using actual radium pond concentrations and wind speed data in equation 3-1, the radon pond flux was calculated from several existing ISL sites (SC&A 2010). Results showed that the radon flux ranged from 0.07 to 13.8 pCi/(m^2-sec). This indicates that the radon flux above some evaporation ponds can be significant (e.g., can exceed 20 pCi/(m^2-sec)). If such levels occur, there are methods for reducing the radium concentration in the ponds, the most straightforward being dilution. However, this solution is temporary, as evaporation will eventually increase the concentration. A second method is to use barium chloride ($BaCl_2$) to co-precipitate the radium to the bottom of the pond. The radon generated at the depths of the bottom sediments will decay before reaching the pond surface.

Again using actual ISL site data, the total annual radon release from the evaporation ponds was calculated and compared to the reported total radon release from three sites. The evaporation pond contribution to the site's total radon release was small (i.e., less than 1%).

Two additional sources of radon release were investigated: the discharge pipe and evaporation sprays. The discharge pipe is used to discharge bleed lixiviant to the evaporation pond. Radon

releases occur when the bleed lixiviant exits the pipe and enters the pond. The investigation found that these radon releases are normally calculated using the methodology in NUREG-1569, Appendix D (NRC 2003); thus, this source is currently included in the total radon releases reported for an ISL site. For a "typical" ISL, with a purge water radon concentration of 3.2×10^5 pCi/L and a purge rate of 5.5×10^5 liters per day (L/d) or about 100 gallons per minute (gpm), NUREG-1569, Appendix D, calculated the radon released from the discharge pipe to be 64 Ci/yr.

Spray systems are sometimes used to enhance evaporation from the ponds. A model to calculate radon releases during spray operation was developed (SC&A 2010). Also, data from ISL ponds were used to estimate this source of radon release. The radon releases from spray operations were reported to range from <0.01 to <3 pCi/(m^2-sec) (SC&A 2010). Furthermore, operation of the sprays would reduce the radon concentration within the pond; therefore, the normal radon release would be depressed once the sprays are turned off (until the radon has had an opportunity to re-equilibrate with the radium). Hence, operation of spray systems to enhance evaporation is not expected to significantly increase the amount of radon released from the pond.

3.4 Heap Leaching

Heap leaching is a process by which chemicals are used to extract the uranium from the ore. A large area of land is leveled with a small gradient, layering it with HDPE or linear low-density polyethylene (LLDPE), sometimes with clay, silt or sand beneath the plastic liner. Ore is extracted from a nearby surface or an underground mine. The extracted ore will typically be run through a crusher and placed in heaps atop the plastic. A leaching agent (often H_2SO_4) will then be sprayed on the ore for 30–90 days. As the leaching agent percolates through the heap the uranium will break its bonds with the oxide rock and enter the solution. The solution will then flow along the gradient into collecting pools from which it will be pumped to an onsite processing plant.

In the past, there have been a few commercial heap leach facilities, but currently none are operating. However, this type of facility can be rapidly constructed and put into operation. Planning and engineering have begun for two heap leach facilities. At the spring 2010 joint NMA/NRC Uranium Recovery Workshop, the NRC identified two proposed heap leach projects, one in Wyoming and the other in New Mexico, as shown in Table 11. In addition to these two projects, Cotter has indicated to the Colorado Department of Public Health and Environment that it intends to retain the use of the secondary impoundment at its Cañon City site for heap leaching in the future (Hamrick 2011).

Table 11: Anticipated New Heap Leach Facilities

Owner	Site	State
Energy Fuels[4]	Sheep Mountain	Wyoming
Uranium Energy Corporation	Grants Ridge	New Mexico

Source: NMA 2010

[4] Energy Fuels acquired the Sheep Mountain Project through its acquisition of Titan Uranium Inc. in February 2012 (http://www.energyfuels.com/development_projects/sheep_mountain/, accessed 9/25/2013).

Higher uranium prices will likely lead to the processing of low-grade ore currently found in the uranium districts in Wyoming and New Mexico. Much of the low-grade ore currently exists in spoil piles that were not economical to truck to milling operations. Little processing equipment is necessary to bring heap leach operations on line. Additionally, minimal personnel are necessary to operate and monitor such an operation. However, the application of NESHAP Subpart W to heap leach facilities should be clarified (see Section 5.0). At a minimum, it is expected that these types of facilities will be limited in acreage according to the Subpart W standard and will be required to have synthetic liners with monitored leak detection systems.

Attempts have been made at heap-leaching low-grade uranium ore, generally by the following process:

(1) Small pieces of uncrushed ore are placed in a pile, or "heap", on an impervious pad of plastic, clay, or asphalt, to prevent uranium and other chemicals from migrating into the subsurface.

(2) An acidic solution is then sprayed onto the heap, which dissolves the uranium as it migrates through the ore.

(3) Perforated pipes under the heap collect the uranium-rich solution, and drain it to collection basins, from where it is piped to the processing plant.

(4) At the processing plant, uranium is concentrated, extracted, stripped, and dried to produce a material called "yellowcake."

(5) Finally, the yellowcake is packed in 55-gallon drums to be transported to a uranium conversion facility, where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Figure 10 shows a schematic of a typical heap-leaching uranium recovery facility.

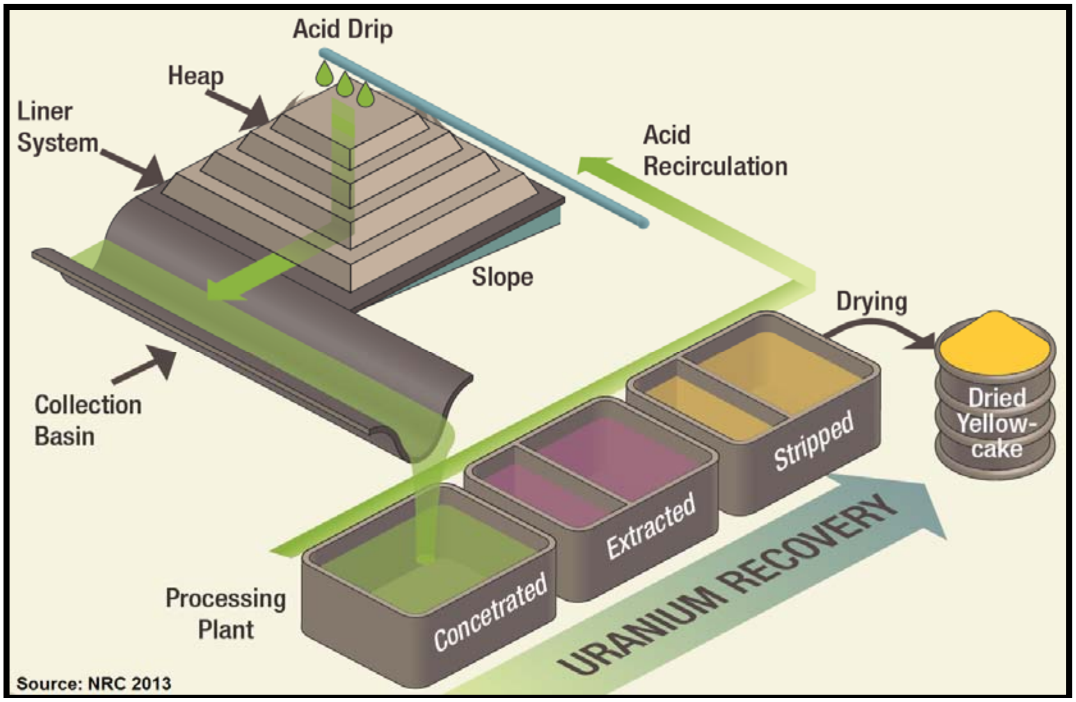


Figure 10: Typical Heap-Leaching Uranium Recovery Facility

Heap-leaching was not an industry trend; rather, it was an attempt to process overburden that contained a minimal concentration of uranium. Production records associated with this processing technique were not maintained, but certainly the technique represented less than 1% of the recovered uranium resources. Almost all of the conventional uranium recovery operations were stand-alone facilities that included the mining, milling, processing, drying, and containerization of the yellowcake product. The yellowcake product was then trucked to processing facilities that refined the raw materials into the desired product.

3.4.1 Sheep Mountain Mine, Energy Fuels, Fremont County, Wyoming

The Sheep Mountain mine, located at approximate 42º 24' North and 107º 49' West, has operated as a conventional underground mine on three separate occasions. Mining on the Sheep Mountain property started in 1956 and continued in several open pit and underground operations until 1982. The Sheep I shaft was sunk in 1974, followed by the Sheep II shaft in 1976. Production from the Sheep I shaft in 1982 was reported to be 312,701 tons at an average grade of 0.107% U_3O_8 (triuranium octoxide). In 1987, an additional 12,959 tons at 0.154% U_3O_8 were produced, followed by 23,000 tons at 0.216% U_3O_8 in 1988. The Sheep II shaft has had no production. The Congo Pit is essentially a single open pit which was being readied for development in the early 1980s, but plans were never realized because of the collapse of the uranium market. Feed from Sheep Mountain was processed at the Split Rock Mill, which was located north of Jeffrey City. Figure 11 shows the Sheep Mountain mine.

Figure 11: Sheep Mountain – Aerial View

Energy Fuels plans to develop the Sheep Mountain mine with both conventional underground and open pit mining, followed by heap leach extraction of the uranium with an ion-exchange recovery plant producing up to 1.5 million pounds of U_3O_8 per year. Energy Fuels' plans include the development of both the Sheep I and Sheep II underground mines, with access from twin declines. At its peak production, the underground mine will produce approximately 1.0 million pounds U_3O_8 per year. The Congo Pit will also be developed, producing an average of 500,000 pounds U_3O_8 per year. Recovery of the uranium will include heap leach pads using H_2SO_4 and a conventional recovery plant, through to yellowcake production on site. Assuming no re-use of heap pads, there will be 100 heap leaching cells, each with a capacity of 66,000 tons of material stacked to a height of 25 feet (ft) over an area of 40 ft by 100 ft. The mineral processing rate will be 500,000 tons per year or greater (Titan Uranium 2010).

Currently, the Wyoming Department of Environmental Quality has issued a fully bonded mining permit to Titan (now Energy Fuels). Energy Fuels is in the process of developing a source material license application for submittal to the NRC around mid-2011. The review and approval process is expected to take about 2 years (i.e., the NRC will complete it in mid-2013). Finally, the Plan of Operation (POO) is being developed and expected to be submitted to the U.S. Bureau of Land Management also around mid-2011. Submittal of the POO will trigger development of an environmental impact statement (EIS). This POO/EIS process is expected to be completed by the end of 2012 (Titan Uranium 2011).

3.5 Method 115 to Monitor Radon Emissions from Uranium Tailings

Subpart W (40 CFR 61.253) requires that compliance with the existing emission standards for uranium tailings be achieved through the use of Method 115, as prescribed in Appendix B to 40 CFR 61. Method 115 consists of numerous sections that discuss the monitoring methods that

must be used in determining the Rn-222 emissions from underground uranium mines, uranium mill tailings piles, phosphogypsum stacks, and other piles of waste material that emits radon.

For uranium tailings piles, Method 115, Section 2.1.3, specifies the minimum number of flux measurements considered necessary to determine a representative mean radon flux value for each type of region on an operating pile:

- Water covered area—no measurements required as radon flux is assumed to be zero.
- Water saturated beaches—100 radon flux measurements.
- Loose and dry top surface—100 radon flux measurements.
- Sides—100 radon flux measurements, except where earthen material is used in dam construction.

The requirement of 300 measurements may result in more measurements then are necessary under the Subpart W design standards. For example, under design standard 40 CFR 61.252(b)(2) for continuous disposal, only 10 acres are uncovered at one time. The 300 flux measurements on a 10-acre area translate into one measurement every 1,500 ft^2, or one every 40 ft. At the time Method 115 was developed and amended to Appendix B (i.e., 1989), the uranium tailings areas were much larger than the Subpart W design standards presently allow. For example, DOE/EIA-0592 (1995) indicates that some mills had tailings areas of over 300 acres (although not necessarily in a single pile).

Method 115, Section 2.1.6, indicates that measuring "radon flux involves the adsorption of radon on activated charcoal in a large-area collector." Since 1989, there have been advances in methods of measuring radon flux. George (2007) is particularly relevant in terms of radon measuring devices:

> *In the last 20 years, new instruments and methods were developed to measure radon by using grab, integrating, and continuous modes of sampling. The most common are scintillation cell monitors, activated carbon collectors, electrets, ion chambers, alpha track detectors, pulse and current ionization chambers, and solid state alpha detectors.*

In George (2007) radon detection is divided into:

I. Passive integrating radon measurements

   (1) Activated carbon collectors of the open face or diffusion barrier type. Charcoal canisters often employ a gamma spectrometer to count the radon daughters as surrogates (bismuth-214, for example). Liquid scintillation vials also use alpha and beta counting. About 70% of radon measurements in the United States are canister type.

(2) Electret ion chambers are being used for 2–7 days duration to measure the voltage reduction (drop). The voltage drop on the electrets is proportional to the radon concentration. About 10%–15% of radon measurements use this methodology.

(3) Alpha track detectors are used for long-term measurements. Alphas from radon penetrate a plastic lattice, which is etched with acid, and the resulting tracks are counted. There is some use in the United States, but this is more popular in Europe.

II. Passive or active continuous radon measurements

(1) Scintillation cell monitors mostly include the flow-through type.

(2) Current and pulse ionization chambers (mostly passive).

(3) Solid state devices are either passive or active if they use a pump to move air through the sensitive volume of the monitor like the RAD 7, which uses a solid state alpha detector (passive implanted planar silicon (PIPS) detector).

Additionally, the Oak Ridge Institute for Science and Education (ORISE) compared various radon flux measurement techniques (ORISE 2011), including activated charcoal containers, the Electric Passive Environmental Radon Monitor (E-PERM) electret ion chamber, the AlphaGUARD specialized ionization chamber, semiconductor detectors to measure radon daughters, and ZnS(Ag) (silver doped zinc sulfide) scintillation detectors. ORISE stated that the last two techniques were not yet commercially available and that the AlphaGUARD detector was "expensive," and thus they are not currently candidates for radon flux monitoring of uranium tailings. Comparing the activated charcoal containers to the E-PERM, ORISE found that while both were easy to operate and relatively inexpensive, the E-PERM showed smaller variations in measurements, and the activated charcoal containers had higher post-processing costs. The only disadvantage of the E-PERM was that its Teflon disks must be replaced after each use. Based on this comparison, ORISE recommended that for a large number of measurements, such as those needed to comply with Subpart W, E-PERM flux monitors would be best.

This brief review of Method 115 demonstrates that its use can still be considered current for monitoring radon flux from uranium tailings. However, it is important to note that the specific design protocols were developed for use at larger tailings impoundments. Alternatively, many commercial enhancements to that design are widely available and in use today. Other forms of passive detectors, as well as active measurement detectors, are also acceptable alternatives to demonstrate conformance with the standard. In addition, the method as currently written has some elements and requirements that should be reviewed and possibly revised, particularly the location and the frequency of measurement. These would be better based on statistical considerations or some other technical basis. Additional discussion of the continued applicability of Method 115 appears in SC&A 2008, ORISE 2011, and George 2007.

4.0 CURRENT UNDERSTANDING OF RADON RISK

Subpart W regulates the emission of radon from operating uranium recovery facility tailings. To enhance the understanding of the need for Subpart W, this section presents a qualitative review and analysis of changes in the analysis of the risks and risk models associated with radon releases from uranium recovery tailings since the publication of the 1989 BID (EPA 1989). After presenting some brief radon basics, the analysis focuses on three areas that have evolved: radon progeny equilibrium fractions, empirical risk factors, and the development of dosimetric risk factors. Finally, Section 4.4 presents the results of a risk assessment performed using current methodology (i.e., CAP88, Version 3 (TEA 2007)), 2011 estimated population distributions, and historical radon release data. Section 4.4 also discusses and compares the current calculated risks to the 1989 risk assessment results, presented in Section 2.3.

4.1 Radon and Dose Definitions

Rn-222 is a noble gas produced by radioactive decay of Ra-226. As shown in Figure 12, one of the longer-lived daughters in the uranium (U)-238 decay series, Ra-226 is a waste product in uranium tailings and liquids from uranium recovery facilities. These include mills, evaporation and surge ponds, typically found in ISL facilities, and heap leach piles. Radium (and its daughter radon) is also part of the natural radiation environment and is ubiquitous in soils and ground water along with its parent uranium.

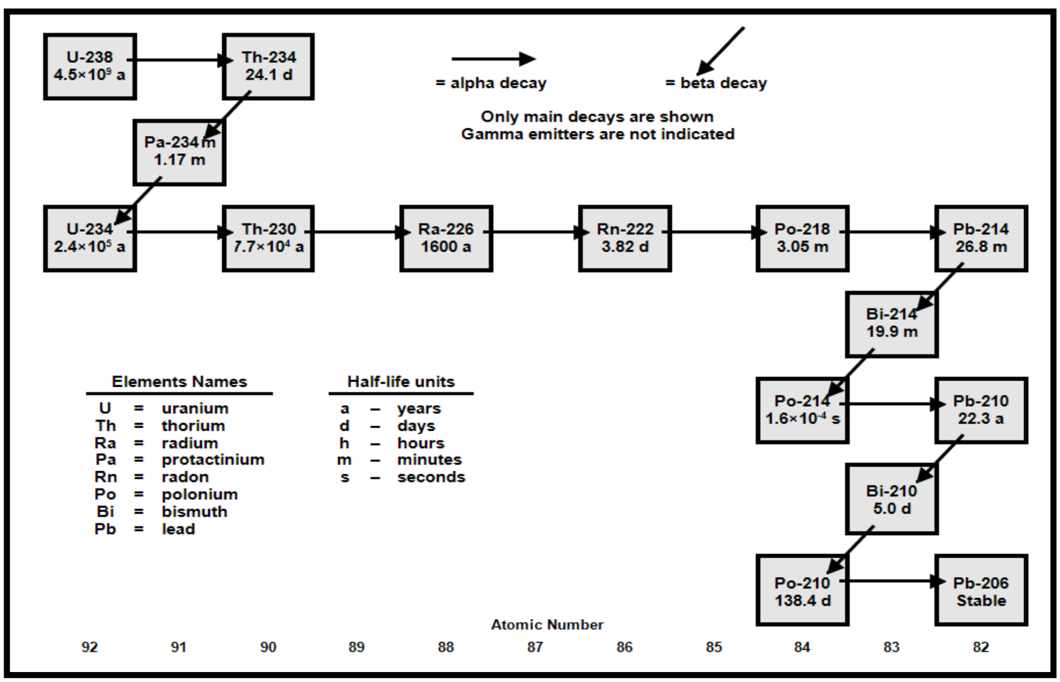


Figure 12: Uranium Decay Series

Radon, with a half-life of 3.8 days, decays into a series of short half-life daughter products or progeny. Being chemically inert, most inhaled radon is quickly exhaled. Radon progeny, however, are charged and electrostatically attach themselves to inhalable aerosol particulates, which are deposited in the lung or directly onto lung tissue. These progeny undergo decay,

releasing alpha, beta, and gamma radiation that interacts directly with lung tissue. Of these interactions, alpha particles from polonium-218 and polonium-214 are the most biologically damaging. The resulting irritation of lung cell tissue particularly from these alpha particles enhances the risk of developing a lung cancer. Determining an estimate of the risk of developing a cancer is of primary importance to establishing the basis for any regulatory initiatives.

4.2 Radon Risk Factors

In 1988, the National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) presented a report on the health risks of radon (BEIR IV, NAS 1988). BEIR IV derived quantitative risk estimates for lung cancer from analyses of epidemiologic data from underground miners. The risk factor presented in BEIR IV for radon was 350 cancer deaths per million person-WLMs[5] of exposure.

The International Commission on Radiological Protection (ICRP), in its Publication 50 (ICRP 1987), addressed the question of lung cancer risk from indoor radon daughter exposures. The ICRP Task Group took a direction quite different from that of the BEIR Committee. The Task Group reviewed published data on three miner cohorts: U.S., Ontario, and Czech uranium miners. When the ICRP 50 relative risk model was run with the 1980 U.S. life table and vital statistics, the combined male and female reference risk was calculated in the 1989 BID to be 4.2×10^{-4} cancer deaths per WLM.

In the 1989 BID, EPA averaged the male and female BEIR IV and ICRP 50 risk coefficients and adjusted the coefficients for background, so that the risk of an excess lung cancer death for a combined population (men and women) was 3.6×10^{-4} WLM^{-1}, with a range from 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1} (EPA 1989).

In addition to epidemiological radon risk coefficients, dosimetric models have been developed as a widely acceptable approach to determine the effects of exposures to radon progeny. One of the principal dosimetric models used to calculate doses to the lung following inhalation of radon and its daughters is the ICRP Human Respiratory Tract Model (HRTM), first introduced in ICRP Publication 66 (ICRP 1994). The ICRP used the HRTM to develop a compilation of effective dose coefficients for the inhalation of radionuclides, presented in Publication 72 (ICRP 1996).

Shortly after the publication of ICRP Publication 72, and using the information in that report, EPA developed Federal Guidance Report 13 (FGR 13) (EPA 1999)[6]. In addition to the risk factors given in FGR 13 itself, the FGR 13 CD Supplement (EPA 2002) provides dose factors, as well as risk factors, for various age groups. For this study, the dose and risk factors from the

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[5] Radon concentrations in air are commonly expressed in units of activity (e.g., picocuries (pCi) or becquerels) per unit volume (e.g., liters (L)); however, radon progeny concentrations are commonly expressed as working levels (WLs). In a closed volume, the concentration of short-lived radon progeny will increase until equilibrium is reached, under these conditions, each pCi/L of radon will give rise to (almost precisely) 0.01 WL, or 100 pCi/L = 1 WL (EPA 2003). Exposure to 1 WL for 1 month (i.e., 170 hours) is referred to as 1 working level month (WLM).

[6] Since FGR 13 was published, several organizations have produced updated radiation risk estimates. EPA 2011 reviewed the update risk estimates and concluded that the new mortality estimates do not differ greatly from those in FGR-13.

FGR 13 CD Supplement were used to calculate the dose and risk due to exposure to 1 WLM of radon and its progeny. The calculation assumed a radon airborne concentration of 100 pCi/L, a radon progeny equilibrium fraction of 0.4, a breathing rate of 0.9167 cubic meters per hour (m^3/hr), and an exposure duration of 170 hours.

The results of this calculation demonstrate that the FGR 13 based radon progeny lung dose conversion factor is between about 2.1 to 7.0 millisieverts (mSv)/WLM, depending on the age of the individual being exposed. The results also show that the lifetime fatality coefficient from lung exposure is between about 6×10^{-4} to 2.4×10^{-3} WLM^{-1}, depending on the exposed individual's age. This agrees well with the factor calculated from empirical data.

In conclusion, the radon progeny risk factor from FGR 13 of 6×10^{-4} WLM^{-1} used in this analysis falls within the risk factor range identified in the 1989 BID (i.e., 1.4×10^{-4} to 7.2×10^{-4} WLM^{-1}), and is about 67% larger than the 3.6×10^{-4} WLM^{-1} radon progeny risk factor used in the 1989 BID. Thus, the radon progeny risk factor used in this Subpart W analysis updates the risk factor used in the 1989 BID to reflect the current understanding of the radon risk, as expressed by the ICRP and in FGR 13.

4.3 Computer Models

Various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium mines were compared. Seven computer programs were considered for use in the uranium tailings radon risk assessment: CAP88 Version 3.0, RESRAD-OFFSITE, MILDOS, GENII, MEPAS, AIRDOS, and AERMOD. A detailed selection process was used to select the program from the first five programs listed. AIRDOS was not included in the detailed selection process, since it is no longer an independent program, but has been incorporated into CAP88 Version 3.0. Because it calculates only atmospheric dispersion, but not radiological doses or risks, AERMOD was also not included. The five remaining programs received a score between 0 and 5 for each of the following 11 criteria: (1) Exposure Pathways Modeled, (2) Population Dose/Risk Capability, (3) Dose Factors Used, (4) Risk Factors Used, (5) Meteorological Data Processing, (6) Source Term Calculations, (7) Verification and Validation, (8) Ease of Use/User Friendly, (9) Documentation, (10) Sensitivity Analysis Capability, and (11) Probabilistic Analysis Capability. Also, each criterion had a weighting factor of between 1 and 2. The total weighted score was calculated for each code, and CAP88 was selected for use in this evaluation. A more complete discussion of the selection of the risk assessment computer code appears in SC&A 2010.

As described in Section 2.3, the 1989 BID used the computer codes AIRDOS-EPA, RADRISK, and DARTAB to calculate the risks due to radon releases from uranium tailings. Subsequent to the publication of the 1989 BID, CAP88 Version 3.0 was produced. CAP88 Version 3.0 was originally composed of the AIRDOS-EPA and DARTAB computer codes and the dose and risk factors from RADRISK (see Section 2.3). CAP88 Version 3.0 was first used for DOE facilities to calculate effective dose equivalents to members of the public to ensure compliance with the then-issued NESHAP Subpart H rules (TEA 2007). Currently, CAP88 Version 3.0 incorporates the dose and risk factors from FGR 13 for determining risks from radionuclides, including the radon decay daughters.

When calculating doses and risk from Rn-222, CAP88 Version 3.0 can be run in two different modes, either normally or in the “radon only” mode. When run in the normal mode, CAP88 Version 3.0 treats radon and its progeny as any other radionuclide and its progeny would be treated. That is, the radon is decayed as it travels from the release point to the dose receptor location, and the in-growth of the progeny is calculated. At the dose receptor location, doses are calculated assuming all the normal exposure pathways, including inhalation and air submersion, that are normally associated with radon doses, and also the exposure pathways from the longer lived radon progeny that deposit onto the ground, including ground shine and food ingestion. To perform these calculations, CAP88 Version 3.0 used the dose and risk factors from FGR 13.

In the “radon only” mode, CAP88 Version 3.0 calculates the risk from the radon WL concentration, but not the dose. The annual risk to an individual or population at a location is simply the WL concentration multiplied by a risk coefficient. The risk coefficient used by CAP88 Version 3.0 is 1.32 cancer fatalities per year per WL. Although this risk coefficient is not documented in any of the CAP88 Version 3.0 user manuals, so its origin is unknown, it can be derived from the CAP88 Version 3.0 output files. A risk coefficient of 1.32 WL-year^{-1} is equivalent to 2.56×10^{-2} cancer deaths per WLM, which is about two orders of magnitude larger than the risk coefficient discussed in Section 4.2. Thus, CAP88’s “radon only” mode was not used to calculate the risk estimates that are summarized in the next section. Rather, the risk estimates are based on CAP88’s atmospheric transport model (for radon decay and progeny buildup) and the radionuclide-specific risk factors from FGR 13.

4.4 Uranium Recovery Facility Radon Dose and Risk Estimates

To perform the CAP88 dose/risk analysis, three types of data were necessary: (1) the distribution of the population living within 80 km (50 mi) of each site, (2) the meteorological data at each site, particularly the wind speed, wind direction, and stability class, and (3) the amount of radon annually released from the site.

Dose/risk assessments were performed for the uranium recovery sites identified in Table 12, which include conventional uranium mills and ISL mines, plus two hypothetical generic sites developed to represent the western and eastern United States.

Table 12: Uranium Recovery Sites Analyzed

Mill / Mine	Type	State	Regulator	Latitude			Longitude		
				deg	min	sec	deg	min	sec
Crow Butte	In-Situ Leach	NE	NRC	42	38	41	-103	21	8
Western Generic	Conventional	NM	NRC	35	31	37	-107	52	52
Alta Mesa 1, 2, 3	In-Situ Leach	TX	State	26	53	59	-98	18	29
Kingsville Dome 1,3	In-Situ Leach	TX	State	27	24	54	-97	46	51
White Mesa Mill	Conventional	UT	State	37	34	26	-109	28	40
Eastern Generic	Conventional	VA	NRC	38	36	0	-78	1	11
Smith Ranch - Highland	In-Situ Leach	WY	NRC	43	3	12	-105	41	8
Christensen/Irigaray	In-Situ Leach	WY	NRC	43	48	15	-106	2	7
Sweetwater Mill	Conventional	WY	NRC	42	3	7	-107	54	41

Normally, the population doses and risks are calculated out to a distance of 80 km (50 mi) from the site. Therefore, it was necessary to know the population to a distance of 80 km from each site in each of the 16 compass directions. This information is not normally available from U.S. Census Bureau data. However, in 1973, EPA wrote a computer program, SECPOP (Sandia 2003), which would convert census block data into the desired 80-km population estimates for any specific latitude and longitude within the continental United States. The NRC adopted this program to perform siting reviews for license applications and has updated the program to use the 2000 census data. SC&A (2011) used the SECPOP program to estimate the population distribution around each site; that population was then modified to account for changes in the population from 2000 to 2010.

For those sites where site-specific meteorological data were identified, those site-specific data were used. For other sites, CAP88 Version 3.0 is provided with a weather library of meteorological data from over 350 National Weather Service stations. For sites without site-specific meteorological data, data from the National Weather Service station nearest the site were used.

Annual radon release estimates were determined for each site based on the available documentation for the site. For example, some sites reported their estimated radon release in their semiannual release reports, while other sites calculated their radon release as part of their license application or renewal application. Finally, for some sites, the annual radon release estimates were obtained from the NRC-produced, site-specific environmental assessment. If multiple documents provided radon release estimates for a particular site, the estimate from the most recent document was used. Consistent with the 1989 assessment, in order to bound the risks, radon releases were estimated from both process effluents and impoundments. Likewise, if both theoretical and actual radon release values were identified for a site, the actual radon release value was given preference.

Additional descriptions of each site's population, meteorology, and radon source term may be found in SC&A 2011. Doses and risks to the RMEI and to the population living within 80 km of the facility were calculated. The RMEI is someone who lives near the facility and is assumed to have living habits that would tend to maximize his/her radiation exposure. For example, the RMEI was assumed to eat all of his/her vegetables from a garden located nearest the facility, which is contaminated with radon progeny as a result of radon releases from the facility. On the other hand, population doses and risks are based on the number of individuals who live within 80 km of the facility. These people are also assumed to eat locally grown vegetables, but not necessarily from the garden located nearest the facility. The RMEI's dose and risk are included within the population dose and risk, since he/she lives within the 80-km radius.

Table 13 presents the RMEI and population doses and risks due to the maximum radon releases estimated for each uranium site.

Table 13: Calculated Maximum Total Annual RMEI, Population Dose and Risk

Uranium Site	Maximum Radon Release (Ci/yr)	Annual Dose		LCF[a, b] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	0.5	1.2	2.9E-06	6.0E-07
White Mesa	1,750	5.2	12.0	3.4E-05	6.4E-06
Smith Ranch - Highlands	36,500	3.7	1.5	2.3E-05	7.7E-07
Crow Butte	8,885	2.7	3.3	1.7E-05	1.7E-06
Christensen/Irigaray	1,600	3.8	1.9	2.4E-05	9.9E-07
Alta Mesa	740	21.6	11.5	1.3E-04	6.1E-06
Kingsville Dome	6,958	58.0	11.3	3.8E-04	6.1E-06
Eastern Generic	1,750	200.3	28.2	1.4E-03	1.6E-05
Western Generic	1,750	5.1	6.0	2.7E-04	7.7E-06

[a]Latent Cancer Fatalities
[b]In this table all risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39.

Table 14 presents the RMEI and population doses and risks due to the average radon releases estimated for each uranium site. The risks were based on average radon releases to make it easier to convert these annual risk values into lifetime risk values. This conversion is done by simply multiplying the Table 14 values by the number of years that the facility operates for the population risk, or by the length of time that the individual lives next to the facility for the RMEI risk.

Table 14: Calculated Average Total Annual RMEI, Population Dose and Risk

Uranium Site	Average Rado n Release (Ci/yr)	Annual Dose		LCF[a] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Populatio n	RMEI
Sweetwater	1,204	0.3	0.7	1.7E-06	3.5E-07
White Mesa	1,388	3.0	7.0	2.0E-05	3.7E-06
Smith Ranch - Highland s	21,100	2.2	0.9	1.3E-05	4.5E-07
Crow Butte	4,467	1.6	1.9	1.0E-05	1.0E-06
Christensen/Irigaray	1,040	2.2	1.1	1.4E-05	5.7E-07
Alta Mesa	472	12.5	6.7	7.6E-05	3.6E-06
Kingsville Dome	1,291	33.6	6.6	2.2E-04	3.5E-06
Eastern Generic	1,388	116.3	16.4	7.9E-04	9.2E-06
Western Generic	1,388	3.0	3.5	1.6E-04	4.4E-06

[a]Latent Cancer Fatalities

The dose and risk to an average member of the population within 0–80 km of each site may be calculated by dividing the population doses and risks from Table 13 and Table 14 by the population for each site. Table 15 shows the results of that calculation.

Table 15: Dose and Risk to an Average Member of the Population

Uranium Site	Dose (mrem)		LCF[(a)] Risk (yr^{-1})	
	Average Release	Maximum Release	Average Release	Maximum Release
Sweetwater	0.03	0.05	1.6E-07	2.7E-07
White Mesa	0.15	0.25	9.6E-07	1.6E-06
Smith Ranch - Highlands	0.03	0.05	1.7E-07	2.9E-07
Crow Butte	0.05	0.08	3.1E-07	5.3E-07
Christensen/Irigaray	0.06	0.11	3.8E-07	6.6E-07
Alta Mesa	0.03	0.05	1.6E-07	2.7E-07
Kingsville Dome	0.07	0.13	4.8E-07	8.3E-07
Eastern Generic	0.05	0.09	3.7E-07	6.4E-07
Western Generic	0.04	0.07	2.2E-06	3.8E-06

[(a)]Latent Cancer Fatalities

As Table 15 shows, the annual latent cancer fatality (LCF) risk to an average member of the population surrounding a uranium site ranges from 1.6×10^{-7} to 1.6×10^{-6} for the seven actual sites, and from 3.7×10^{-7} to 3.8×10^{-6} for the two hypothetical generic sites.

The study estimated that the annual fatal cancer risk to the RMEI ranges from 3.5×10^{-7} to 6.4×10^{-6} for the seven actual sites, and from 4.4×10^{-6} to 1.6×10^{-5} for the two hypothetical generic sites. The highest annual individual risk occurred at the Eastern Generic site, which is not surprising considering that the nearest individual was assumed to reside only about 1 mi from the hypothetical site. It is likely that during the site selection process for an actual facility, a site this close to residences would be eliminated and/or the design of the facility would include features for reducing radon emissions in order to reduce the RMEI risk.

The lifetime risk would depend on how long an individual was exposed. For example, for the seven actual sites analyzed, assuming that the uranium mill operates for 10 years, then the lifetime fatal cancer risk to the RMEI would be 3.5×10^{-6} to 3.7×10^{-5}. Alternatively, if it is assumed that an individual was exposed for his/her entire lifetime (i.e., 70 years), then the lifetime fatal cancer risk to the RMEI would be 2.45×10^{-5} to 2.59×10^{-4}. For the two hypothetical generic sites, the lifetime fatal cancer risk to the RMEI would be 4.4×10^{-5} to 9.2×10^{-5} assuming 10 years of mill operation, or 3.1×10^{-5} to 6.44×10^{-5} assuming 70 years of mill operation. The lifetime risk calculation uses only the average radon release results, because while the maximum could occur for a single year, it is unlikely that the maximum would occur for 10 or 70 continuous years.

The study also estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years to the 1.8 million persons living within 80 km of the sites.

4.5 Summary of Radon Risk

This section described the evolution in the understanding of the risk presented by radon and its progeny since the 1989 BID was published. Additionally, the computer code CAP88 Version 3.0 was used to analyze the radon risk from seven operating uranium recovery sites and two generic sites.

The lifetime MIR calculated using data from seven actual uranium recovery sites was determined to be between 2.45×10^{-5} to 2.59×10^{-4}. The low end of the range is lower than the 3×10^{-5} lifetime MIR reported in the 1989 rulemaking for existing impoundments (see Section 2.3.1), while the high end of the range is slightly higher than the 1.6×10^{-4} lifetime MIR reported in the 1989 rulemaking for new impoundments (see Section 2.3.2).

In protecting public health, EPA strives to provide the maximum feasible protection by limiting radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}) the lifetime MIR. Although the calculated high end of the lifetime MIR range is above 10^{-4}, the assumptions that radon releases occur continuously for 70 years and that the same RMEI is exposed to those releases for the entire 70 years are very conservative.

Similarly, the risk assessment estimated that the risk to the population from all seven real uranium sites is between 0.0005 and 0.0009 fatal cancers per year, or approximately one case every 1,080 to 1,865 years among the 1.8 million persons living within 80 km of the sites. For the 1989 rulemaking, the estimated annual fatal cancer incidence to the 2 million people living within 80 km of the sites was 0.0043, which was less than one case every 200 years for existing impoundments, and 0.014, or approximately one case every 70 years for new impoundments (see Sections 2.3.1 and 2.3.2).

5.0 EVALUATION OF SUBPART W REQUIREMENTS

The evaluation of Subpart W requirements required analyses of several items to determine if the current technology had advanced since the promulgation of the rule. These topics are listed below, along with the key issues addressed in this report to determine whether the requirements of Subpart W are necessary and sufficient.

5.1 Items Reviewed and Key Issues

Each of these items will be reviewed with reference to the relevant portions of this document:

(1) Review and compile a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed.

Key Issue – The standard should be clarified to ensure that all owners and operators of uranium recovery facilities (conventional mills, ISL, and heap leach) are aware that all of the structures and facilities they employ to manage uranium byproduct material (i.e., tailings) are regulated under Subpart W.

(2) Compare and contrast those technologies with the engineering requirements of hazardous waste impoundments regulated under RCRA Subtitle C disposal facilities, which are used as the design basis for existing uranium byproduct material (i.e., tailings) impoundments.

Key Issue – All new impoundments shall adopt the design and engineering standards referred to through 40 CFR 192.32(a)(1).

(3) Review the regulatory history.

Key Issue – NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator's duty under the CAA for operating uranium mill tailings.

(4) Tailings impoundment technologies.

Key Issue – The emission limit for impoundments that existed as of December 15, 1989, has been demonstrated to be both achievable and sufficient to limit risks to the levels that were found to protect public health with an ample margin of safety.

The requirement that impoundments opened after December 15, 1989, use either phased or continuous disposal technologies as appropriate to ensure that public health is protected with an ample margin of safety, which is consistent with section 112(d) of the 1990 Amendments of the CAA, which requires standards based on GACT.

(5) Radon measurement methods used to determine compliance with the existing standards.

Key issue – The approved method (Method 115, 40 CFR 61, Appendix B) of monitoring Rn-222 to demonstrate compliance with the emission limit for impoundments that existed as of December 15, 1989, is still valid.

(6) Compare the 1989 risk assessment with current risk assessment approaches.

Key Issue – Adoption of a lower emission limit is not necessary to protect public health, as the current limit has been shown to be protective of human health and the environment. Impact costs associated with the limit are considered to be acceptable.

5.1.1 Existing and Proposed Uranium Recovery Facilities

Sections 3.2, 3.3, and 3.4 describe the three types of uranium recovery facilities: conventional mills, ISL facilities, and heap leach facilities. Each facility type is briefly described below.

Conventional Mills

Section 3 of this report presents a review of the existing and proposed uranium recovery facilities. As indicated, there are five conventional mills at various stages of licensing, with various capacities to receive tailings. Of these five conventional mills, only White Mesa is

operational. Some of these were constructed before December 15, 1989, and fall under the Subpart W monitoring requirement. Table 16 shows the current conventional mills with pre-December 15, 1989 conventional impoundments.

Table 16: Current Pre-December 15, 1989 Conventional Impoundments

Conventional Mill Name	Regulatory Status	Pre-December 15, 1989 Impoundments
Sweetwater	Standby,* license expires November 2014	37 acres not full
Shootaring Canyon	Standby,* license extension May 2013	Only 7 acres of impoundment filled
White Mesa	Active, license expires March 2015	Cell 2 closed, Cell 3 almost full

* Standby means the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations.

The White Mesa Mill (see Section 3.2.2) has one pre-1989 cell (Cell 3) that is authorized to accept tailings and is still open. Cell 2 is closed. Both cells are monitored for radon flux. The average radon flux for Cell 2 was calculated at 13.5 pCi/(m^2-sec), while that at Cell 3 was 8.9 pCi/(m^2-sec). The mill also uses an impoundment constructed before 1989 as an evaporation pond.

The Sweetwater Mill (see Section 3.2.1) has a 60-acre tailings management area with a 37-acre tailings impoundment of which 28 acres are dry with an earthen cover. The remainder is covered by water. The radon flux from this impoundment is monitored yearly. The average flux (using Method 115) for the entire impoundment was 6.01 pCi/(m^2-sec), including the water-covered area, which had an assumed flux of zero.

The Shootaring Canyon Mill (see Section 3.2.3) had plans for an upper and lower impoundment, but only the upper impoundment was constructed. As the mill operated for approximately 30 days, only about 7 acres of tailings were deposited in the upper impoundment. These have a soil cover. The average radon flux from the covered tailings was measured using Method 115 at 11.9 pCi/(m^2-sec) in April 2010.

The Piñon Ridge Mill (see Section 3.2.4) is a permitted conventional uranium recovery facility in Montrose County, Colorado. The facility has not been constructed; however, there are current activities at the site, including a pre-operational environmental monitoring program.

In-Situ Recovery

As discussed in Section 3.3, ISL was first conducted in 1963 and soon expanded so that by the mid-1980s, a fair proportion of the recovered uranium was by ISL. Table 8shows the ISL facilities in the United States that are currently operational. As previously discussed, the economics of ISL uranium recovery are conducive to lower grade deposits or deeply buried deposits that could not be economically recovered with conventional open pit or underground mining. Thus, approximately 23 facilities are restarting, expanding, or planning for new operations (see Table 9).

Of particular importance to Subpart W are the impoundments that are an integral part of all ISL facilities. These impoundments are required to maintain the hydrostatic gradient toward the leach

field to minimize excursions referred to as "flare," a proportionality factor designed to estimate the amount of aquifer water outside of the pore volume that has been impacted by lixiviant flow during the extraction phase. While these impoundments typically do not reach the size and scale of conventional tailings piles, they are an integral component of ISL, contain various amounts of radium, and can function as sources of radon gas. Section 3.3.1 provides the mathematical framework for estimating the quantity of radon being emitted from an impoundment. The subsequent discussion of Subpart W, including a proposed standard for impoundments constructed after December 15, 1989, will further evaluate this radon flux.

Heap Leach Facilities

The few commercial heap leach facilities established in the 1980s have been shut down. Recently, however, two heap leach facilities have been proposed: one in Wyoming (Sheep Mountain – Energy Fuels) and one in New Mexico (Grants Ridge, Uranium Energy Corporation) (see Section 3.4). If the price of uranium increases, then recovery of uranium from heap-leaching low-grade ores will become economically attractive and will likely lead to additional facilities. The question to be addressed from the standpoint of Subpart W is the radon flux released from the active heap leach pile. Also, once the uranium is removed from the ore in the heap leach pile, the spent ore becomes a byproduct material much like the tailings, albeit not mobile. This spent ore contains radium that releases radon. As the heap leach pile is constructed to allow lixiviant to "trickle through" the pile, these same pathways could allow for radon release by diffusion out of the spent ore and then through the pile, which is addressed under Subpart W.

5.1.2 RCRA Comparison

Both alternative disposal methods presented in Subpart W (work practices) require that tailings impoundments constructed after December 15, 1989, meet the requirements of 40 CFR 192.32(a)(1). Tailings impoundments include surface impoundments, which are defined in 40 CFR 260.10:

> *Surface impoundment or impoundment means a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.*

The above definition encompasses conventional tailings ponds, ISL ponds, and heap leach piles. The last is included as it is assumed that the heap leach pile will be diked or otherwise constructed so as not to lose pregnant liquor coming from the heap.

This being the case, 40 CFR 264.221(a) states that the impoundment shall be designed and constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Requirements of the liner system listed in 40 CFR 264.221(c) include:

(1)(i)(A) A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into such liner during the active life.

(1)(i)(B) A composite bottom liner, consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life and post-closure care period. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least 3 ft (91 centimeters (cm)) of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec).

The regulation also requires a leachate collection system:

(2) The *leachate collection and removal system* between the liners, and immediately above the bottom composite liner in the case of multiple leachate collection and removal systems, is also a *leak detection system.* This leak detection system must be capable of detecting, collecting, and removing leaks of hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to waste or leachate during the active life and post-closure care period.

Other requirements for the design and operation of impoundments, given in 40 CFR 264 Subpart K, include construction specifications, slope requirements, and sump and removal requirements. The above requirements are important to new uranium containment/impoundment systems because of the potential that water will be used to limit the radon flux from a containment/impoundment. Thus, it is also important to minimize the potential for ground water or surface water contamination. For conventional mill tailings impoundments, the work practices require a soil cover. With heap leach piles, the moisture in the heap would limit radon during operations, and after operations, a degree of moisture would be required to ensure that the radon diffusion coefficient is kept low (see Section 5.4).

5.1.3 Regulatory History

Section 2.0 reviewed the regulatory history of Subpart W. This review indicates that NESHAP Subpart W continues to be the appropriate regulatory tool to implement the Administrator’s duty under the CAA. The following presents the use of GACT (see Section 5.3) in detail and describes its use in conventional and other than conventional uranium recovery.

5.1.4 Tailings Impoundment Technologies

Sections 2.3.1 and 2.3.2 discuss tailings impoundment technologies. The two primary changes to the technology as it was previously practiced were first that owners and/or operators of conventional mill tailings impoundments must meet the requirements of 40 CFR 192.32(a)(1) and second that they must adhere to one of the two work practices previously discussed (for

impoundments constructed after December 15, 1989). Within these limits, tailings impoundment technologies have had no fundamental changes.

5.1.5 Radon Measurement Methods

As previously described, Subpart W defines two separate standards. The first states that existing sources (as of December 15, 1989) must ensure that emissions to the ambient air from an existing uranium mill tailings pile shall not exceed 20 pCi/(m^2-sec) of Rn-222. To demonstrate compliance with this emission standard, facilities are required to monitor emissions in accordance with Method 115 of 40 CFR 61, Appendix B, and file an annual report with EPA that shows the results of the compliance monitoring (see Section 3.5). As pointed out in Appendix B, the focus of the monitoring was on the beaches, tops, and sides of conventional piles. The radon flux from the water-covered portion of the tailings pile was assumed to be zero. Although regulated under Subpart W, it is unclear how to monitor the radon flux off the surface of evaporation ponds at conventional mills, ISLs, or heap leach facilities. Since these ponds are considerably smaller than tailings impoundments, the solution was to specify that as long as the water cover is 1 meter or more during the active life of the pond, no monitoring is necessary (see Section 3.3.1).

Section 3.3.1 also shows that, for evaporation ponds at ISL facilities, the radon flux from the surface is a function of the wind speed and the concentration of radium in the water. Estimates using actual ISL data showed the contribution to the sites' total radon release to be less than 1% of the total. In any case, the radon flux can also be reduced by co-precipitating the radium using barium chloride ($BaCl_2$) co-precipitation treatment to reduce the radium concentration.

For impoundments constructed on or after December 15, 1989, monitoring is not required. Rather, Subpart W requires that these impoundments comply with one of two work practice standards: the first practice limits the size of the impoundment to 40 acres or less, which limits the radon source, while the second practice of continuous disposal does not allow uncovered tailings to accumulate in large quantities, which also limits radon emissions.

For evaporation ponds or holding ponds as in the pre-December 15, 1989, case, a 1-meter cover of water should be sufficient to limit the radon flux to the atmosphere (see Section 3.3.1). Thus, the proposed GACT is that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size or area restriction, and that during the active life of the pond at least 1 meter of liquid be maintained in the pond.

The last facility is the potential heap leach pile. Subpart W applies to the material in the pile as byproduct material is being generated. Considering a small section of the pile as the leach (acid or base) solubilizes the uranium, the material left is byproduct material. The result is a material similar to tailings and the heap is also wet. It is assumed that if the moisture content is greater than 30%, the heap is not dewatered. As long as the heap is not dewatered, the radon diffusion coefficient is such that minimal radon will escape the heap leach pile.

Heap Leach Radon Flux

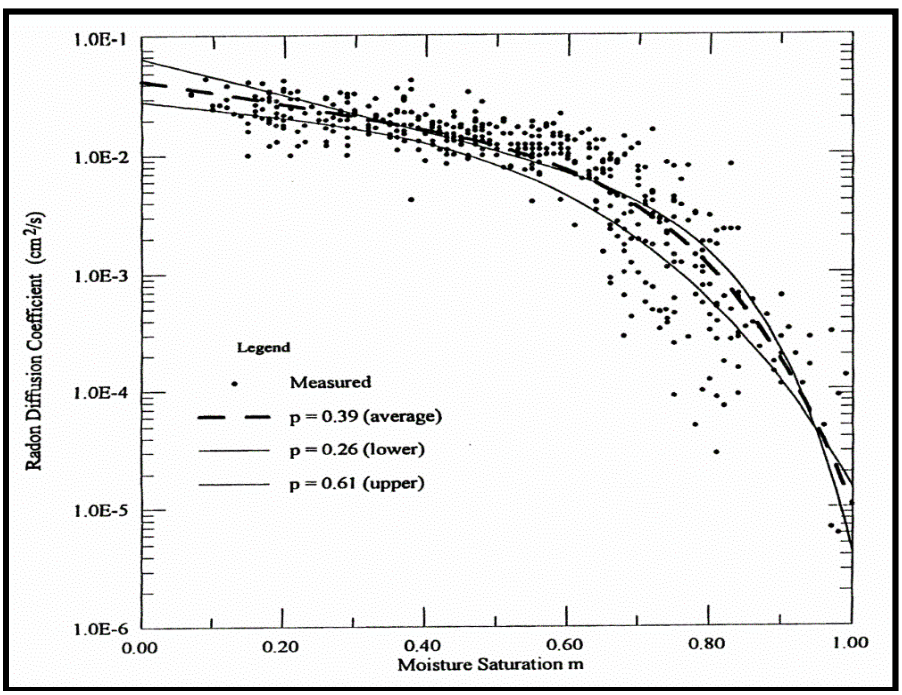
A possible source of radon from a heap leach pile is from the surface of the pile. Assuming that the heap pile is more than 1 or 2 meters thick, the radon flux from this configuration can be estimated from the following formula (NRC 1984):

$$J = 10^4 R \rho E \sqrt{\lambda D_e} \qquad (5\text{-}1)$$

Where

J	=	radon flux (pCi/(m^2-sec))
10^4	=	units conversion (cm^2/m^2)
R	=	specific activity of radium (pCi/g)
ρ	=	dry bulk density of material (1.8 g/cc)
E	=	emanation coefficient
λ	=	radon decay constant (2.11×10^{-6} sec^{-1})
D_e	=	radon diffusion coefficient (cm^2/sec)
	=	$D_0\, p\, exp[-6\, m\, p - 6\, m^{14\, p}]$ (5-2)
D_0	=	radon diffusion coefficient in air (0.11 cm^2/sec)
m	=	moisture saturation fraction
p	=	total porosity

The above empirical expression for the radon diffusion coefficient was developed by Rogers and Nielson (1991), based on 1,073 diffusion coefficient measurements on natural soils. Figure 13 shows that the diffusion coefficient calculated using the empirical expression agrees well with the measured data points over the whole range of moisture saturation at which diffusion coefficient measurements were made.



Source: Rogers and Nielson 1991, as reported in Li and Chen 1994

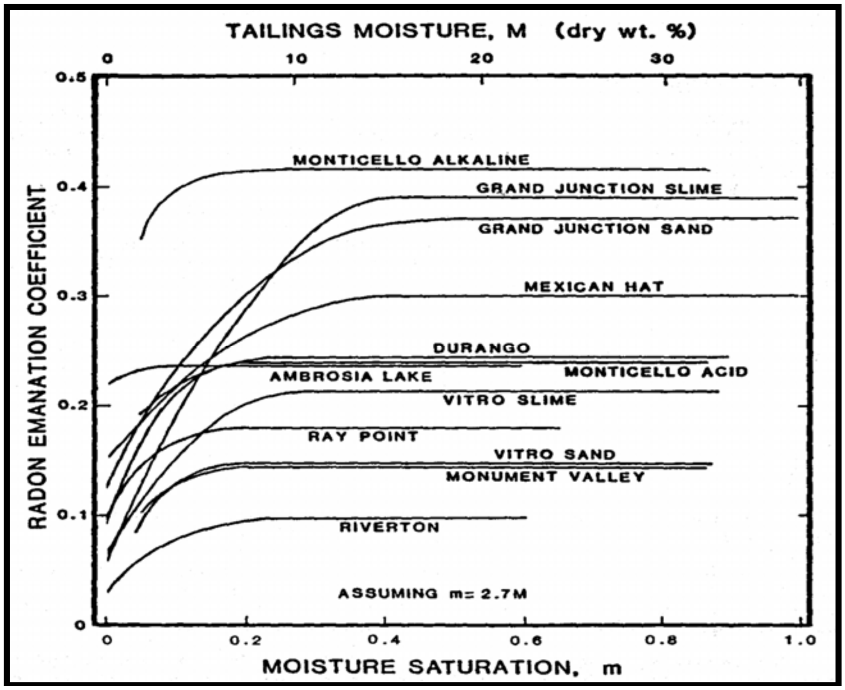
Figure 13: Diffusion Coefficient as a Function of Moisture Saturation

Figure 13 also demonstrates that as the moisture increases, the radon diffusion coefficient decreases significantly. This is because radon diffuses 10,000 times more slowly in water than it does in air (Drago 1998, as reported in Brown 2010). Therefore, adding moisture to the radium-containing material (whether it be a tailings pile or a heap pile) would decrease the diffusion coefficient, thereby increasing the time it takes for radon to diffuse out of the material and allowing more radon to decay before it can be released. As Figure 13 shows, the decrease in the radon diffusion coefficient can be significant, especially at high moisture levels.

However, in addition to the radon diffusion coefficient, the radon emanation coefficient is sensitive to the amount of moisture present. When a radium atom decays, one of three things can happen to the resulting radon atom: (1) it may travel a short distance and remain embedded in the same grain, (2) it can travel across a pore space and become embedded in an adjacent grain, or (3) it is released into a pore space. The fraction of radon atoms released into the pore space is termed the "radon emanation coefficient" (Schumann 1993). As soil moisture increases, it affects the emanation coefficient by surrounding the soil grains with a thin film of water, which slows radon atoms as they are ejected from the soil grain, increasing the likelihood that the radon atom will remain in the pore space. Research by Sun and Furbish (1995) describes this relationship between moisture saturation and the radon emanation rate:

> *The greater the moisture saturation is, the greater the possible radon emanation rate is. With moisture contents from 10% up to 30%, the recoil emanation rates quickly reach the emanation rate of the saturated condition. As the moisture reaches 30%, a universal thin film on the pore surface is formed. This thin film is sufficient to stop the recoil radon from embedding into another part of the pore wall.*

Figure 14 shows that the radon emanation coefficient can vary considerably for different tailings piles. Figure 14 also agrees with Sun and Furbish (1995) in that it shows that the emanation coefficient tends to level off when the moisture saturation level is above approximately 30%.



Source: NRC 1984

Figure 14: Emanation Coefficient as a Function of Moisture Content and Moisture Saturation

In conclusion, a moisture saturation level of up to about 30% tends to increase the radon emanation coefficient and decrease the radon diffusion coefficient, such that the amount of radon released from the pile could increase with increasing moisture. Above about 30% moisture saturation, the radon emanation coefficient is unchanged by increasing moisture, while the radon diffusion coefficient continues to decrease. Figure 15 shows the total effect of moisture on the radon flux. Equation 5-1 was used to develop Figure 15, along with the Rogers and Nielson (1991) empirical equation for the diffusion coefficient, an approximation of the Vitro Sand emanation coefficient from Figure 14, and a porosity of 0.39. Figure 15 does not show the radon flux values, since they would vary depending on the radium concentration and would not affect the shape of the curve.

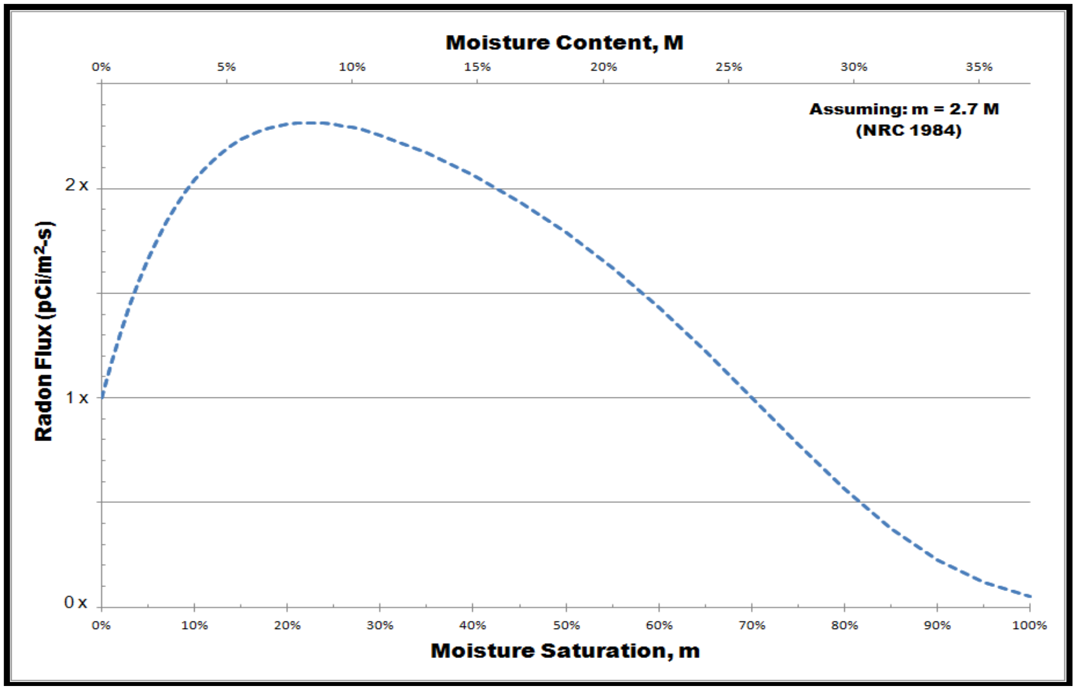


Figure 15: Radon Flux as a Function of Moisture Saturation and Moisture Content

Figure 15 shows that the radon flux starts low and increases as the moisture saturation increases due to the emanation coefficient. At between 20% and 30% moisture saturation, the flux reaches a peak that is about 2½ times the flux at zero moisture, after which the diffusion coefficient takes control and the flux decreases. Figure 15 is consistent with the results reported by Hosoda et al. (2007) in their study of the effect of moisture on the emanation of radon and thoron gases from weathered granite soil:

> *A sporadic increase in the radon and thoron exhalation rates was caused by the increase in the moisture content up to 8%* [27% moisture saturation]. *However, the exhalation rates showed a decreasing tendency with the increase in moisture content over 8%…, both measured and calculated radon exhalation rates had similar trends with an increase in the moisture content in the soil.*

The final point from Figure 15 is that the radon flux with a moisture content of 70% or greater is less than the flux at zero moisture, and that with a porosity of 0.39, 70% moisture saturation is equivalent to 27% moisture by weight. Thus, 30% moisture by weight would result in a radon flux significantly below the zero moisture flux.

5.1.6 Risk Assessment

Section 4.4 presents the results of a risk assessment performed for seven actual uranium recovery sites plus two generic uranium recovery sites. This risk assessment used the CAP88 Version 3.0 analytical computer model, which, as described in Section 4.0, evolved from and differs from the models used for the 1989 risk assessment (i.e., AIRDOS-EPA, RADRISK, and DARTAB). Additionally, this assessment used the latest radon dose and risk coefficients (i.e., millirem

(mrem)/picocurie (pCi) and LCF/pCi) from FGR 13. Both the 1989 assessment and this assessment used site-specific meteorological data. This assessment used 2000 census data, updated to 2010, whereas the 1989 assessment used 1983 data. Finally, as stated above, this assessment used actual historical radon releases from the uranium recovery sites, whereas because of the lack of site-specific data, the 1989 assessment assumed a radon release rate based on 1 pCi/(m^2-sec) Rn-222 emitted per pCi/g Ra-226 during both the operating, standby, drying, and/or disposal phase, and either 20 pCi/(m^2-sec) or the design flux (if known) during the post-disposal phase.

Section 4.4 presents the doses and risks calculated by the current risk assessment, and Section 4.5summarizes them. Additional information on the current risk assessment appears in SC&A 2011.

5.2 Uranium Recovery Source Categories

The preceding items and key issues are the basis for categorizing the major uranium recovery methods that will lead to methods of reducing radon emissions. The next section, which addresses the GACT standard, further discusses the applicability of the control measures. The following source categories represent a logical breakdown of the current uranium recovery industry:

Conventional Impoundments – Conventional impoundments are engineered structures for storage and eventual permanent disposal of the fine-grained waste from mining and milling operations (i.e., tailings). All conventional uranium recovery mills have one or more conventional impoundments. Table 3 shows conventional uranium milling facilities that are either built or licensed. This category will also include future conventional milling facilities.

Nonconventional Impoundments – At nonconventional tailings impoundments, tailings (byproduct material) are contained in ponds and covered by liquids. These impoundments are normally called “evaporation ponds” or “holding ponds.” Nonetheless, they contain byproduct material and, as shown in Section 3.3.1, can generate radon gas. This category is usually associated with ISL facilities (i.e., process waste water resulting from ISL operations (see Section 3.3)), but can also be associated with conventional facilities or heap leach facilities. While these ponds do not meet the work practices for conventional mills, they still must meet the requirements of 40 CFR 192.32(a)(1).

Heap Leach Piles – While no heap leach facilities are currently operating in the United States, at least one potential operation is expected to go forward (see Section 3.4). Heap leach piles contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct. As stated above, the design and operation of the heap leach is expected to follow the requirements of 40 CFR 192.32(a)(1).

5.3 The GACT Standard

Section 112(d) of the CAA requires EPA to establish NESHAPs for both major and area sources of HAPs that are listed for regulation under CAA section 112(c). Section 112(c) lists

radionuclides, including radon, as a HAP, while section 112(a) defines two types of HAP sources: major sources and area sources. Depending on whether the source is a major or area source, section 112(d) prescribes standards for regulation of emissions of HAP. A "major source," other than for radionuclides, is defined as any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, in the aggregate, 10 tons per year or more of any HAP. For radionuclides, major source shall have the meaning specified by the Administrator by rule. An area source is a stationary source that is not a major source.

The regulation of HAPs at major sources is dictated by the use of MACT. Section 112(d) defines MACT as the maximum degree of reduction in HAP emissions that the Administrator determines is achievable, considering the cost of achieving the reduction and any non-air-quality health and environmental impacts and energy requirements. With respect to area sources, section 112(d)(5) states that, in lieu of promulgating a MACT standard, the Administrator may elect to promulgate standards that provide for the use of GACT or management practices to reduce HAP emissions.

In 2000, EPA provided guidance to clarify how to apply the major source threshold for HAPs as defined in section 112(b) of the CAA Amendments of 1990. The guidance stated how to apply the major source threshold specifically for radionuclides:

> *There have been some questions about determining the major source threshold for sources of radionuclides. Section 112(a)(1) allows the Administrator to establish different criteria for determining what constitutes a major source of radionuclides since radionuclides emissions are not measured in units of tons. This, however, would not preclude a known radionuclide emitter that is collocated with other HAP-emitting activities at a plant site from being considered a major source due to the more common, weight-based threshold. The July 16, 1992, source category list notice did not include any sources of radionuclides because no source met the weight-based major source threshold, and the Agency had not defined different criteria. At the current time, there remain no listed major source categories of radionuclide emissions.* [EPA 2000b]

Based on this guidance, radon emissions from uranium recovery facility tailings impoundments are not a major source, and therefore, they are area sources for which the GACT standard is applicable. Unlike MACT, the meaning of GACT, or what is "generally available" is not defined in the act. However, section 112(d)(5) of the CAA Amendments for 1990 authorizes EPA to:

> *Promulgate standards or requirements applicable to [area] sources…which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.*

The Senate report on the legislation (U.S. Senate 1989) provides additional information on GACT and describes it as:

> *…methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic*

impacts and the technical capabilities of the forms to operate and maintain the emissions control systems.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. Also considered are the standards applicable to major sources in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, technologies and practices at area and major sources in similar categories are also reviewed to determine whether such technologies and practices can be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, the costs and economic impacts of available control technologies and management practices on that category are considered.

Thus, as presented above, "Promulgate standards or requirements … " does not limit EPA to strict "standard setting" in order to provide for the use of GACT. Rather, it allows EPA to promulgate at least two types of rules: rules that set emission levels based on specific controls or management practices (this is analogous to the MACT standard setting), and rules that establish permitting or other regulatory processes that result in the identification and application of GACT standards.

5.4 Uranium Recovery Categories and GACT

For conventional impoundments, the 1989 promulgation of Subpart W contained two work practice standards, phased disposal and continuous disposal (see Section 2.0, page 7). The work practice standards limit the size and number of the impoundments at a uranium recovery facility in order to limit radon emissions. The standards cannot be applied to a single pile that is larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). This approach was taken in recognition that the radon emissions from these impoundments could be greater if the piles were left dry and uncovered. The 1989 Subpart W also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for preventing and mitigating ground water contamination.

As discussed earlier, it is no longer believed that a distinction needs to be made for conventional impoundments based on the date when they were design and/or constructed. The existing impoundments at both the Shootaring Canyon (Section 3.2.3) and Sweetwater (Section 3.2.1) facilities can meet the work practice standards in the current Subpart W regulation. Impoundments at both these facilities have an area of less than 40 acres and are synthetically lined as required in 40 CFR 192.32(a). Also, the existing Cell 3 at the White Mesa mill will be closed in 2012 and replaced with impoundments that meet the phased disposal work practice standard (Section 3.2.2). Therefore, there is no reason not to apply the work practice standards required for impoundments designed or constructed after December 15, 1989, to these older impoundments. By incorporating these impoundments under the work practice standards, the requirement of radon flux testing is no longer needed and will be eliminated.

For the proposed GACT, the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards were evaluated. Liner requirements in use for the permitting of hazardous waste land disposal units under RCRA are contained in 40 CFR 264.221. Since 40 CFR 192.32(a)(1) references 40 CFR 264.221, it is the only requirement necessary for Subpart W, as the RCRA requirements are effective methods of containing tailings and protecting ground water while also limiting radon emissions. The regulation in 40 CFR 264.221 contains safeguards to allow for the placement of tailings and also provides for an early warning system in the event of a leak in the liner system. Therefore, the proposed GACT for conventional impoundments retains the two work practice standards and the requirements of 40 CFR 192.32(a)(1), because they have proven to be effective methods for limiting radon emissions while also protecting ground water. The NRC considers the requirements of 40 CFR 192.32(a) in its review during the licensing process.

For nonconventional impoundments, where tailings (byproduct material) are contained in ponds and covered by liquids, a new GACT is proposed. These facilities, called “evaporation ponds” or “holding ponds,” also must meet the requirements of 40 CFR 192.32(a)(1). Specifically, these are the design and operating requirements for the impoundments. Because of the general experience that a depth of greater than 1 meter of liquid essentially reduces the radon flux of ponds to negligible levels, no monitoring is required for this type of impoundment. Given these factors, the following GACT is proposed:

> Nonconventional impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and during the active life of the pond, at least 1 meter of liquid be maintained in the pond.

For the last category, heap leach piles, an approach similar to that for nonconventional impoundments is proposed. As previously noted, these facilities contain byproduct material, which is the residue of the operation. That is, as the lixiviant mobilizes the uranium, the remaining part of the ore becomes byproduct material, which is regulated under Subpart W. As for nonconventional impoundments, the design and operation of the heap leach pile is expected to follow the requirements of 40 CFR 192.32(a)(1). This also will prevent the loss of pregnant liquor (lixiviant with dissolved uranium) from spillage or leakage.

The byproduct material that makes up the volume of the spent heap leach pile is typically wet. As Figure 15 shows, as material goes from dry to wet the radon flux first increases before it decreases (the reasons for this are discussed in Section 5.1.5). While it is impossible to maintain a completely wet state, it is possible to maintain a sufficient percentage of moisture content to meet a goal that the radon flux in the wetted material is below what the flux would be if the material was dry. This percentage is related to the state or material being “dewatered.” By way of definition, 40 CFR 61.251(c) states:

> Dewatered *means to remove the water from recently produced tailings by mechanical or evaporative methods such that the water content of the tailings does not exceed 30 percent by weight.*

Thus, the proposed GACT for heap leach piles is that, in addition to meeting 40 CFR 192.32(a)(1), operating heap leach piles must maintain a moisture content greater than

30% (equivalent to about 70% to 80% moisture saturation, as described in Section 5.1.5). This would, as indicated, ensure that the radon flux from the surface of the pile is quite low, i.e., at or below what the flux would be if the material in the pile was dry.

Since the purpose of this GACT is to control the radon emissions, it may not be critical to maintain the 30% moisture content in the lower levels/lifts of the pile. The reason for this is two-fold; first, radon generated in the lower levels would have to travel further in the pile before it would escape to the atmosphere, thereby giving it more time to decay within the pile, and second, radon from the lower layers will be slowed due to the 30% moisture content in the upper levels. Additionally, if inter-lift liners are provided when the pile is composed of multiple lifts, the inter-lift liner would act as a barrier to radon from the lower lifts, and thus mitigate the need for those lower lifts to maintain the 30% moisture content. On the other hand, because radon emission do not stop when active uranium leaching has ceased, it will be necessary to continue wetting the pile to maintain the 30% moisture content until a final reclamation cover (including a radon barrier layer) has been constructed over the pile.

5.5 Other Issues

During the review of Subpart W, several additional issues were identified. These are identified and discussed in this section.

5.5.1 Extending Monitoring Requirements

In reviewing Subpart W, EPA examined whether radon monitoring should be extended to all impoundments constructed and operated since 1989 so that the monitoring requirement would apply to all impoundments containing uranium byproduct material (i.e., tailings). EPA also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. As the rule currently exists, only pre-1989 conventional tailings impoundments are required to monitor for radon emissions, the requirement being an average flux rate of not more than 20 pCi/(m^2-sec). This is because, at the time of promulgation of the 1989 rule, EPA stated that the proposed work practice standards would be effective in reducing radon emissions from operating impoundments. Since the work practice standards could not be applied to pre-1989 facilities, and since EPA determined that it is not feasible to prescribe an emissions standard for radon emissions from a tailings impoundment (54 FR 9644 (FR 1989a)), the improved work practice standards would limit radon emissions by limiting the amount of tailings exposed.

Thus, it is not necessary to require radon monitoring at facilities constructed after the current Subpart W was promulgated (i.e., December 15, 1989). With respect to tailings and the amount of water used to cover them, the work practice standards (now proposed as GACTs) are also protective in preventing excess radon emissions. Further, for nonconventional impoundments, where there is no applicable radon monitoring method, the standing liquid requirement will effectively prevent all radon emissions from holding or evaporation ponds.

5.5.2 Clarification of the Term "Operation"

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement [which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W]. An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

> <u>Operation.</u> Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

5.5.3 Clarification of the Term "Standby"

In the past, there has been confusion as to whether the requirements of Subpart W apply to a uranium recovery facility that is in "standby" mode. Although not formally defined in Subpart W, "standby" is commonly taken to be the period of time when a facility may not be accepting new tailings, but has not yet entered closure operations. This period usually takes place when the price of uranium is such that it may not be cost effective for the facility to continue operations, and yet the facility fully intends to operate once the price of uranium rises to a point where it is cost effective for the facility to re-establish operations. As shown in Table 3, the Sweetwater and Shootaring Canyon mills are currently in standby. While in standby, a uranium recovery facility can change its license from an operating license to a possession only license, thereby reducing its regulatory obligations (and costs).

The addition of the following definition of "closure" into the Subpart W definitions at 40 CFR 61.251 would eliminate confusion:

> <u>Standby</u>. Standby means the period of time that a facility may not be accepting new tailings, but has not yet entered closure operations.

5.5.4 The Role of Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these western regions, the annual average precipitation (see Figure 16) falling on the impoundment is less than the annual average evaporation (see Figure 17) from the impoundment. Also, these facilities are located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. However, recent uranium exploration in the United States shows the potential to move eastward, into more climatologically temperate regions of the country. South central Virginia is now being considered for a conventional uranium mill (e.g., the Coles Hills, see Table 4). To determine whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

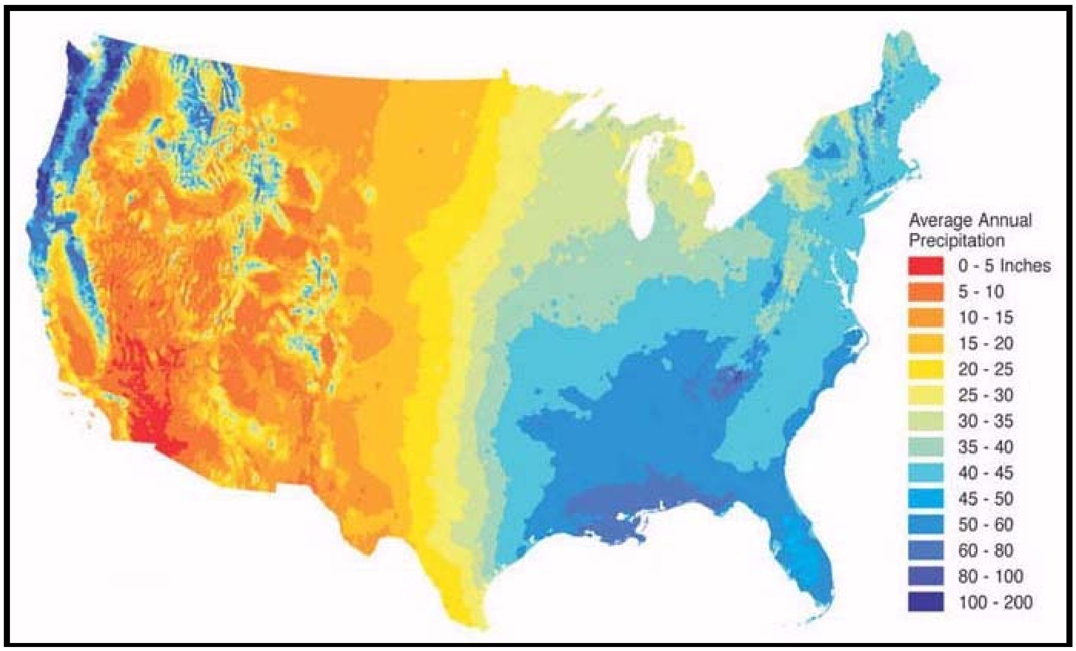


Figure 16: U.S. Average Annual Precipitation

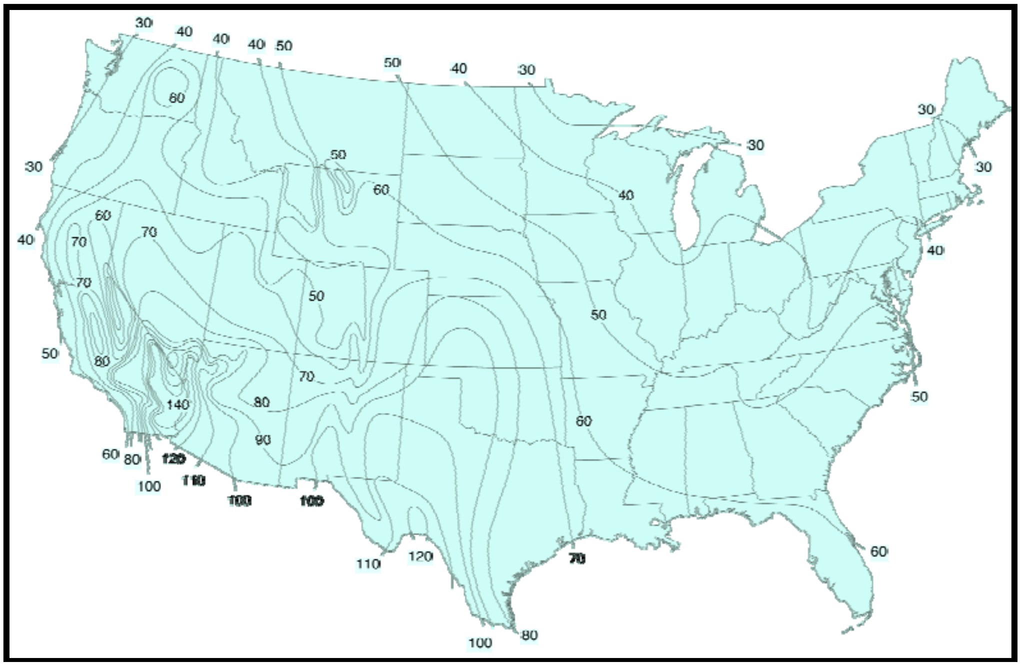


Figure 17: U.S. Mean Annual Evaporation

Subpart W requires owners and operators of uranium tailings impoundments to follow the requirements of 40 CFR 192.32(a). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that can be used to ensure proper operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action; rainfall; run-on; malfunctions of level controllers, alarms and other equipment; or human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed, and maintained with sufficient structural integrity to prevent massive dike failure. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Uranium recovery facilities are already operating under the requirements of 40 CFR 192.32(a)(1), including compliance with 40 CFR 264.221(g) and (h), which will provide protection against the weather events likely to occur in the eastern United States.

6.0 ECONOMIC IMPACTS ASSOCIATED WITH REVISION/MODIFICATION OF THE SUBPART W STANDARD

This section contains the following economic impact analyses necessary to support any potential revision of the Subpart W NESHAP:

- Section 6.1 provides a review and summary of the original 1989 economic assessment and supporting documents.

- The baseline economic costs for development of new conventional mills and ISL and

heap leach facilities are developed and presented in Section 6.2.

- Section 6.3 presents the anticipated industry costs versus environmental and public health benefits to be derived from each of the four proposed GACT standards.

- Finally, Section 6.4 provides demographic data regarding the racial and socioeconomic composition of the populations surrounding uranium recovery facilities.

To assess the economic impacts of potential revisions to the Subpart W NESHAP, capital costs (including equipment costs), labor costs, taxes, etc., were obtained from actual recent cost estimates that have been prepared for companies planning to design, develop, construct, and operate uranium recovery facilities. For ISL facilities, two recent cost estimates were used as the basis for this analysis, while for conventional mills and heap leach facilities, a single cost estimate was used for each type of facility. Other necessary data, such as a discount rate, borrowing, and interest rates, were assumed, as described in Section 6.2.

Where feasible and appropriate, the economic models and recommendations from EPA's "Guidelines for Preparing Economic Analyses" (EPA 2010) were followed in assessing these economic impacts.

The cost and economic impact estimates described in Section 6.2 and 6.3 are based on industry data compiled in 2010-2011. Therefore, some of the analytical input values would differ somewhat if they were updated to reflect the latest information available. For example, the current long-term market price of uranium is approximately 17 percent lower than the $65 estimate that is used in the analysis (Cameco, 2013). The uranium mining industry is currently experiencing a volatile period resulting from the aftereffects of the Fukushima nuclear disaster. In particular, uranium demand has suffered from nearly all of Japan's workable reactors remaining offline since the March 2011 earthquake and tsunami triggered multiple meltdowns at the Fukushima Dai-ichi plant. Given the atypical post-Fukushima uranium market situation of the last couple of years and the prospects for a return to more normal market activity in the mid-term future,[7] we have decided not to update the analysis to incorporate the latest industry data. The results of the analyses described in this section are judged to be realistic estimates of the mid- to long-term impacts of the proposed Subpart W NESHAP.

6.1 1989 Economic Assessment

When Subpart W was promulgated in 1989, EPA performed both an analysis of the standard's benefits and cost and an evaluation of its economic impacts. Those analyses appear in the 1989 BID, Volume 3, Sections 4.4 and 4.5 (EPA 1989). This section briefly summarizes the Subpart W economic assessments performed in 1989.

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[7]These prospects include: the conclusion of the U.S.-Russia program that annually removes 24 million pounds of ex-military highly enriched uranium from the market via down-blending for use as U.S. nuclear fuel; the 60 nuclear power plants that are currently under construction throughout the world; efforts to reduce climate change emissions; and expectations that Japan will slowly begin restarting its 50 nuclear plants.

In these 1989 assessments, EPA evaluated the benefits and costs associated with three separate decisions. The first decision concerned a limit on allowable radon emissions after closure. The options evaluated included reducing radon emissions from the 20 pCi/(m^2-sec) limit to 6 pCi/(m^2-sec) and 2 pCi/(m^2-sec).

The second decision that EPA investigated was the means by which the emissions from active mills could be reduced to the 20 pCi/(m^2-sec) limit while operations continue. Emissions could be reduced by applying earth and water covers to portions of the dry areas of the tailings piles, which could reduce average radon emissions for the entire site to the 20 pCi/(m^2-sec) limit.

While the first two decisions were focused on tailings piles that existed at the time the standard was promulgated, the third concerned future tailings impoundments. EPA evaluated alternative work practices for the control of radon emissions from operating mills in the future. Options investigated include the replacement of the traditional single-cell impoundment (i.e., the 1989 baseline) with phased disposal or continuous disposal impoundments.

6.1.1 Reducing Post-Closure Radon Emissions from 20 pCi/(m^2-sec)

The 1989 BID estimated the total annual tailings piles radon emissions for standards of 20, 6, and 2 pCi/(m^2-sec) and calculated the cancers that could result from those emissions. It found that over a 100-year analysis period, the 6 pCi/(m^2-sec) option could lower local and regional risks by 3.6 cancers, while the incremental benefit of lowering the allowable flux rate from 6 to 2 pCi/(m^2-sec) was estimated at 1.0 cancer.

The increased costs associated with reducing the allowable flux rate from 20 to 6 pCi/(m^2-sec) were estimated to be between $113 and $180 million (1988$) ($205 and $327 million (2011$)), while attainment of a 2 pCi/(m^2-sec) flux rate was estimated to result in added costs of $216 to $345 million (1988$) ($393 to $627 million (2011$)).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. As the following excerpt from the preamble to the standard shows, for tailings piles at operating mills, EPA's decision was based on the very low risks associated with 20 pCi/(m^2-sec), rather than on a comparison of the benefits versus the costs of the alternative emission standards:

> *... the risks from current emissions are very low. A NESHAP requiring that emissions from operating mill tailings piles limit their emissions to no more than 20 pCi/(m^2-sec) represents current emissions. EPA has determined that the risks are low enough that it is unnecessary to reduce the already low risks from the tailings piles further.* [FR 1989a, page 51680]

While for tailings impoundments at inactive mills, the preamble presented a quantitative cost-benefit comparison as justification for maintaining the radon emission level at 20 pCi/(m^2-sec):

EPA examined these small reductions in incidence and maximum individual risk and the relatively large costs of achieving Alternative II [6 pCi/(m^2-s)]*, $158 million capital coat and $33 million in annualized costs and determined that Alternative I* [20 pCi/(m^2-s)] *protects public health with an ample margin of safety.* [FR 1989a, page 51682]

6.1.2 Reducing Radon Emissions During Operation of Existing Mills

The 1989 BID estimated the reduction in total risk that could be obtained by reducing radon emissions from active mills operating at that time to 20 pCi/(m^2-sec) through the application of an earthen cover and/or by keeping the tailings wet. The 1989 BID, Table 4-41, reported the risk reduction to be 0.17 fatal cancers for all active mills over their assumed 15-year operational life.

The 1989 BID, Table 4-42B, reported that the cost for providing the earthen covers and for keeping the tailings wet over the 15-year operating period was estimated to be $13.166 million (1988$) ($23.94 million in 2011$).

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. EPA nonetheless decided that without these standards the risks were too high, as the following segment from the preamble to the standard indicates:

… EPA recognizes that the risks from mill tailings piles can increase dramatically if they are allowed to dry and remain uncovered. An example of how high the risks can rise if the piles are dry and uncovered can be seen in the proposed rule, 54 FR 9645. That analysis assumed that the piles were dry and uncovered and the risks were as high as 3×10^{-2} with 1.6 fatal cancers per year. Therefore, EPA is promulgating a standard that will limit radon emissions to an average of 20 pCi/m^2-s. This rule will have the practical effect of requiring the mill operators to keep their piles wet or covered. … [FR 1989a, page 51680]

6.1.3 Promulgating a Work Practice Standard for Future Tailings Impoundments

Section 4.4.3.1 of the 1989 BID provides the following explanations of the phased and continuous disposal options:

Phased Disposal

The first alternative work practice which is evaluated for model new tailings impoundments is phased disposal. In phased or multiple cell disposal, the tailings impoundment area is partitioned into cells which are used independently of other cells. After a cell has been filled, it can be dewatered and covered, and another cell used. Tailings are pumped to one initial cell until it is full. Tailings are then pumped to a newly constructed second cell and the former cell is dewatered and then left to dry. After the first cell dries, it is covered with earth obtained from the construction of a third cell. This process is continued sequentially. This system

minimizes emissions at any given time since a cell can be covered after use without interfering with operations as opposed to the case of a single cell.

Phased disposal is effective in reducing radon-222 emissions since tailings are initially covered with water and finally with earth. Only during a drying-out period of about 5 years for each cell are there any [significant] *radon-222 emissions from the relatively small area. During mill standby periods, a water cover could be maintained on the operational cell. For extended standby periods, the cell could be dewatered and a dirt cover applied.*

Continuous Disposal

The second alternative work practice, continuous disposal, is based on the fact that water can be removed from the tailings slurry prior to disposal. The relatively dry dewatered (25 to 30% moisture [by weight]*) tailings can then be dumped and covered with soil almost immediately. No extended drying phase is required, and therefore very little additional work would be required during final closure. Additionally, ground water problems are minimized.*

To implement a dewatering system would introduce complications in terms of planning, design, and modification of current designs. Acid-based leaching processes do not generally recycle water, and additional holding ponds with ancillary piping and pumping systems would be required to handle the liquid removed from the tailings. Using trucks or conveyor systems to transport the tailings to disposal areas might also be more costly than slurry pumping. Thus, although tailings are more easily managed after dewatering, this practice would have to be carefully considered on a site-specific basis.

Various filtering systems such as rotary vacuum and belt filters are available and could be adapted to a tailings dewatering system. Experimental studies would probably be required for a specific ore to determine the filter media and dewatering properties of the sand and slime fractions. Modifications to the typical mill ore grinding circuit may be required to allow efficient dewatering and to prevent filter plugging or blinding. Corrosion-resistant materials would be required in any tailings dewatering system due to the highly corrosive solutions which must be handled. …

The committed fatal cancer risk[8] from the operation of model baseline (single-cell), phased disposal, and continuous disposal impoundments, as determined by the 1989 BID, is shown in Table 17. Table 17 shows the following:

[during] *the operational period the risk of cancer is reduced, relative to the single cell baseline, by 0.129 if phased disposal is adopted and by 0.195 if the continuous single cell method is used. The risk reduction associated with using the continuous single cell relative to the phased approach is 0.066. In the post-operational phase, phased disposal raises the risk by 0.012 relative to the*

[8] "Committed fatal cancer risk" is the likeliness that an individual will develop and die from cancer at some time in the future due to their current exposure to radiation. "Committed fatal cancer risk" is sometimes referred to as "latent cancer fatality risk."

baseline, while the continuous single cell approach lowers it by 0.017 relative to the baseline and by 0.028 relative to phased disposal. [EPA 1989, Section 4.4.3.3]

Table 17: Radon Risk Resulting from Alternative Work Practices (Committed Cancers)

	Baseline (Single Cell)	Phased Disposal	Continuous Disposal
Operational Period (0 to 20 years)	0.282	0.153	0.087
Post-Operations (21 to 100 years)	0.264	0.276	0.247
Total	0.546	0.429	0.334

Source: EPA 1989, Table 4-45

Concerning the cost to implement the work practices, the 1989 BID indicates the following:

the phased … disposal impoundment is the most expensive design ($54.02 million [1988$]*), while the single cell … impoundment ($36.55 million* [1988$]*) is the least expensive. Costs for the continuous single cell design ($40.82 million* [1988$]*) are only slightly more than those of the single cell impoundment, although the uncertainties surrounding the technology used in this design are the largest*. [EPA 1989, Section 4.4.3.4]

The 1989 BID does not make any statement regarding the monetized value of reduced cancer risks. Nor does it explicitly weigh the costs and benefits of the alternative standards. However, as the following excerpt from the preamble to the standard shows, EPA was concerned about the uncertainty of the benefits and costs analysis that had been performed for this portion of the regulation. Ultimately, the Agency based its decision on the small cost to implement the work practices, rather than on weighing the benefits versus the costs:

The uncertainty arises because it assumes a steady state industry over time. If the uranium market once again booms there would be increased risks associated with Alternative I [one large impoundment (i.e., baseline)]. *If the industry then experienced another economic downturn, the costs of Alternative I would increase because of the economic waste that occurs when a large impoundment is constructed and not filled. The risks can also increase if a company goes bankrupt and cannot afford the increased costs of closing a large impoundment and the pile sits uncovered emitting radon. The risks can also increase if many new piles are constructed, creating the potential for the population and individual risks to be higher than EPA has calculated.*

These uncertainties significantly affect the accuracy of the [benefits and costs] *analysis and given the small cost of going to Alternatives II* [phased disposal] *and III* [continuous disposal]*, EPA has determined that in order to protect the public*

with an ample margin of safety, both now and in the future, new mill tailings impoundments must use phased or continuous disposal. [FR 1989a, page 51680]

6.1.4 Economic Impacts

To determine the economic impacts of the proposed Subpart W on the uranium production industry, the 1989 BID evaluated two extreme cases; in the first, it was assumed that "no portion of the cost of the regulation can be passed on to the purchaser of U_3O_8," and in the second, it was "assumed that the uranium production industry is able to recover the entire increase in the tailings disposal cost by charging higher U_3O_8 prices." These two cases provided the lower and upper bound, respectively, of the likely economic impacts of Subpart W on the uranium production industry.

As described in Section 3.1, from 1982 to 1986, the uranium production industry had been contracting and experiencing substantial losses because of excess production capacity. The 1989 Subpart W economic impact assessment concluded that if the industry had to absorb the costs of implementing the regulation, the present value cost at that time would be about five times the industry losses from 1982 to 1986, or equal to about 10% of the book value of industry assets at that time, or about 15% of industry's liabilities.

Alternatively, if the uranium production industry could pass on the Subpart W implementation costs to its electric power industry customers, who would likely pass on the costs to the electricity users, the 1989 economic impact assessment concluded:

> *The revenue earned by the* [electric power] *industry for generating 2.4 trillion kilowatt hours of electricity in 1986 was 121.40 billion dollars. The 1987 present value of the regulation (estimated to be $250 million) is less than 1 percent (.06%) of the U.S. total electric power revenue for the same year.* [EPA 1989, Section 4.5.1]

The 1989 BID drew no conclusions regarding what effects, if any, these impacts would have on the uranium production industry's financial health.

6.2 U_3O_8 Recovery Baseline Economics

This section presents the baseline economics for development of new conventional mills, ISL facilities, and heap leach facilities. EPA's economic assessment guidelines define the baseline economics as "a reference point that reflects the world without the proposed [or in the case of Subpart W, the modified] regulation. It is the starting point for conducting an economic analysis of potential benefits and costs of a proposed [or modified] regulation" (EPA 2010, Section 5).

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the conventional mill, data from the proposed new mill at the Piñon Ridge project in Colorado were used. For the ISL facility, data from two proposed new facilities were used: the first was the Centennial Uranium project in Colorado and the second was the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production

period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, data from the Sheep Mountain project in Wyoming were used. Sections 6.2.1 through 6.2.4 provide details of how the project-specific cost data were converted into base case economic data, and Section 6.2.5 presents a short sensitivity study for the conventional mill and heap leach cost estimates. Because two projects were analyzed, a sensitivity analysis of the ISL cost estimates was not performed.

Next it was necessary to estimate the annual amount of U_3O_8 that is currently used and how much would be required in the future. For these estimates, data from the Energy Information Administration (EIA) were used. Section 6.2.6 describes how the EIA data were coupled with specific cost data for the uranium recovery facilities to determine the cost and revenue estimates provided in Table 18.

Table 18: Uranium Recovery Baseline Economics (Nondiscounted)

Cost / Revenue	2009 ($1,000)		2035 Projections ($1,000)*			
	2009$	2011$	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$347,000	$462,000	$502,000	$473,000	$605,000	$706,000
U_3O_8 Cost	$298,000	$372,000				
Conventional			$398,000	$375,000	$480,000	$560,000
In-Situ Leach			$396,000	$373,000	$477,000	$557,000
Heap Leach			$356,000	$335,000	$429,000	$501,000
Mixed Facilities			$392,000	$368,000	$472,000	$553,000

* See the discussion below and in Section 6.2.6 for a description of these cases.

Table 18 presents uranium production industry cost and revenue for six cases. The first two cases are based on the actual amount of U_3O_8 produced in the United States in 2009 (the last year for which data are available). The two 2009 cases differ in that the first is based on 2009 dollars, including the weighted-average price of $48.92 per pound for uranium of U.S. origin, while the second was based on assumptions used in this analysis (i.e., 2011 dollars and a U_3O_8 price of $65 per pound). The remaining four cases in Table 26 are all based on the assumptions used in this analysis, but differ in the amount of U_3O_8 assumed to be produced in the United States in 2035. The first through third 2035 cases are for the Reference, Low Nuclear Production, and High Nuclear Production projected 2035 nuclear power usage, as estimated by the EIA (see Section 6.2.6). It should be noted that most of the U_3O_8 used in the United States is from foreign suppliers. The fourth 2035 case (Ref Low Import) increases the percentage of U.S.-origin uranium to 20% for the reference nuclear power usage estimate.

For each of the four 2035 projection cases, four assumptions were made regarding the source of the U_3O_8: (1) all U_3O_8 is from conventional mills, (2) all U_3O_8 is from ISL (recovery) facilities, (3) all U_3O_8 is from heap leach facilities, and (4) the U_3O_8 is from a mixture of uranium recovery facilities (see Section 6.2.6, page 87, for a definition of the mixture). Table 19 shows that the type of uranium recovery facility assumed makes only about a 15% difference between the lowest cost (heap leach) and the largest cost (ISL) recovery type facility.

6.2.1 Conventional Mill Cost Estimate

The base case economic costs for development of a new conventional mill were developed using data from the proposed new mill at Piñon Ridge in Colorado (Edge 2009). Although cost estimates for other conventional mills were reviewed, e.g., Coles Hill (Lyntek 2010), Church Rock (BDC 2011), the Piñon Ridge cost estimate was selected for the base case because it is believed to be the furthest advanced. Specific cost data obtained from the Piñon Ridge project (i.e., Edge 2009, Tables 7.1-1 and 7.1-2) were for land acquisition and facility construction, operating and maintenance, decommissioning, and regulatory oversight. While the Piñon Ridge project supplied the mill design parameters and the overall magnitude of the cost, additional data on the breakdown of the capital and operating costs were taken from the Coles Hill uranium project located in Virginia (Lyntek 2010).

Assumptions used to develop the conventional mill base case cost estimate include:

- As per the Piñon Ridge project, the mill design processing capacity is1,000 tons per day (tpd), and the licensed operating processing rate is 500 tpd.

- The operating duration is 40 years, as per the Piñon Ridge project.

- Because they were more detailed, the Coles Hill cost data (Lyntek 2010) were used to generate a percentage breakdown of the Piñon Ridge cost estimates (Edge 2009). For example, the Piñon Ridge operating cost estimate was divided into labor, power and water, spare parts, office and lab supplies, yellowcake transportation, tailings operating, and general and administration (G&A) using Coles Hill percentages. Thus, the Coles Hill data affected the detailed breakdown of the cost estimate, but not its magnitude.

- Ore grades are 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The base case analysis did not use the Piñon Ridge project's average ore grade of 0.23%.

- The U_3O_8 recovery rate is 96% per the Piñon Ridge project.

- A line of credit (LoC) of $146 million has an annual interest rate of 4%, with a 20-year payback period.

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

The Piñon Ridge project data do not include the costs to develop and/or operate a uranium mine. Rather, it is assumed that these costs are included in the cost of the uranium ore purchased for processing at the Piñon Ridge mill. Mine development and operating costs are included for the conventional mill based on an average of the open pit and underground mine costs developed for the heap leach facility (see Section 6.2.2).

Table 19 presents the cost estimates that were developed for the conventional uranium mill.

Table 19: Conventional Mill Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)	7,000	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	15,958	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$1,037,299	$617,406	$369,925
Line of Credit (LoC)	$146,000	$154,891	$167,155
Mine Costs			
Development	$82,553	$49,136	$29,440
Operating	$261,195	$155,465	$93,148
Mill Costs			
Construction	$134,073	$139,870	$147,761
Mill Direct	$53,136	$55,434	$58,562
Mill Indirect	$9,547	$9,960	$10,522
Mill Contingency	$15,671	$16,348	$17,271
Tailings	$55,718	$58,128	$61,407
Operating and Maintenance	$124,397	$74,042	$44,363
Labor (All inclusive)	$59,267	$35,276	$21,136
Power & Water	$19,400	$11,547	$6,919
Spare Parts	$15,883	$9,454	$5,664
Office and Lab Supplies	$5,117	$3,045	$1,825
Yellowcake Transportation	$2,239	$1,332	$798
Tailings Operating	$22,492	$13,387	$8,021
G&A	$8,634	$5,139	$3,079
Taxes, Claims, and Royalties	$119,289	$71,002	$42,541
Regulatory Oversight	$11,800	$7,191	$4,541
Decommissioning/Closure	$12,000	$3,679	$801
Repay LoC, plus Finance Costs	$214,859	$169,561	$130,302
Total Cost	$968,801	$675,085	$495,978

The cash balance for the conventional mill (as well as the other uranium recovery facilities) is shown in Figure 18. Figure 18 shows that until production year 18, when the LoC has been paid off, the conventional mill is just breaking even.

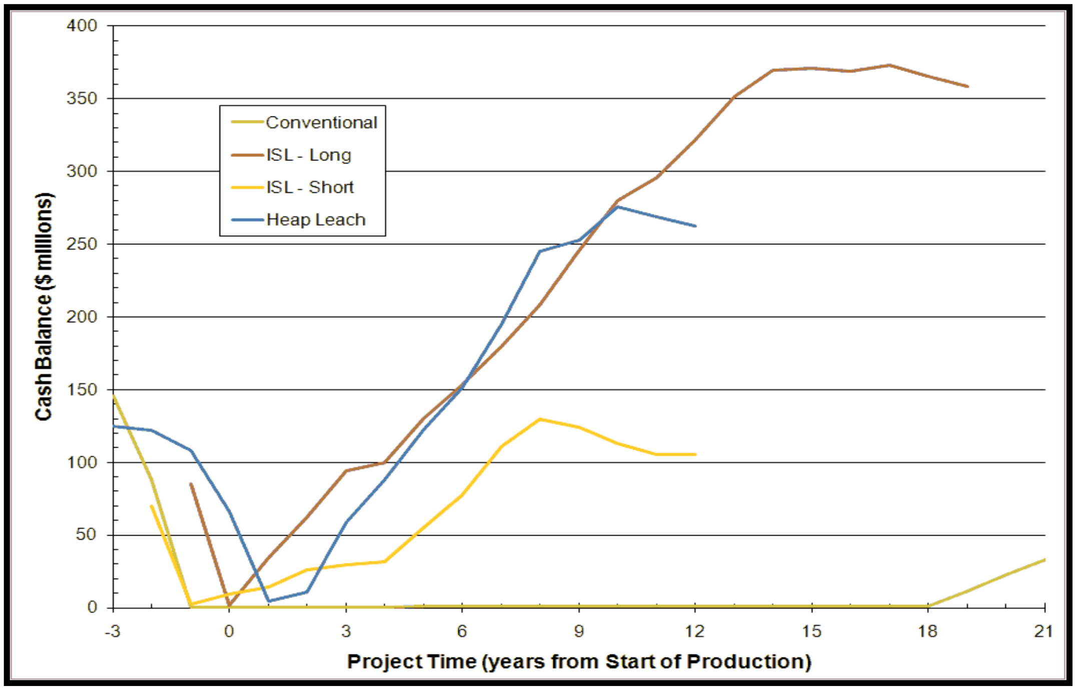


Figure 18: Estimated Cash Balance – Reference Cases

Figure 19 shows the assumed annual U_3O_8 production from the conventional mill (as well as the other uranium recovery facilities). Based on the assumptions used for the base case, the conventional mill produces the least amount of U_3O_8 annually.

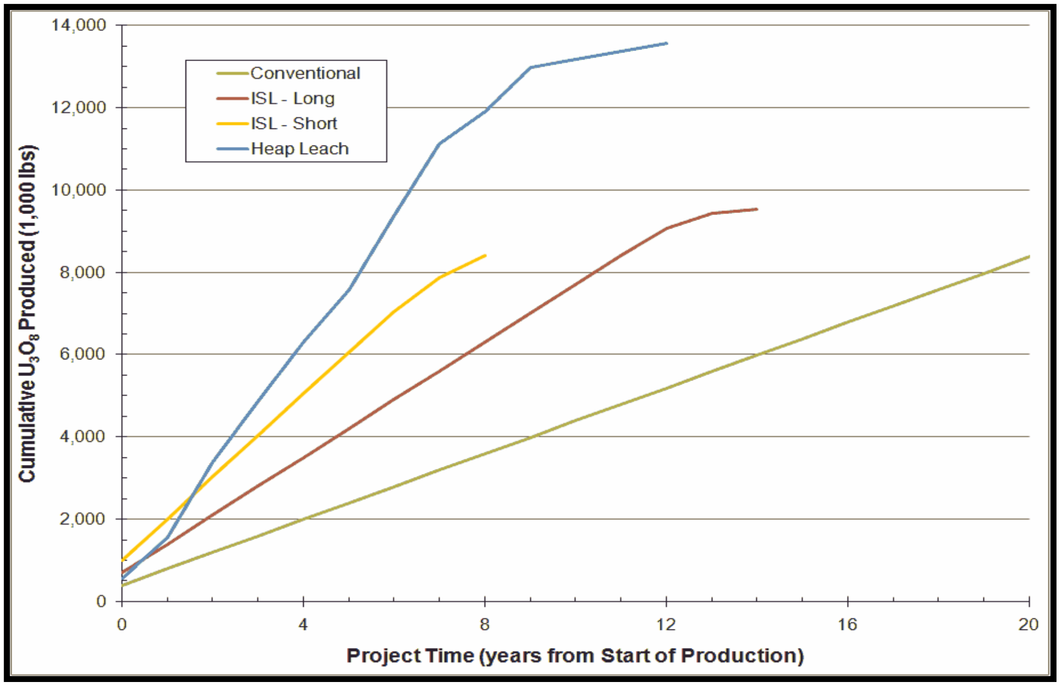


Figure 19: Cumulative U_3O_8 Projections – Reference Cases

6.2.2 Heap Leach Facility Cost Estimate

The base case economic costs for development of a new heap leach facility were developed using data from the proposed new facility at Sheep Mountain in Wyoming (BRS 2011). Specific assumptions used to develop the base case cost estimate for the heap leach facility include:

- The operating duration is 13 years, as per the Sheep Mountain project's uranium production schedule. The annual amount of ore processed averaged 491,758 tons, with maximum and minimum annual processing rates of 916,500 and 74,802 tons, respectively (BRS 2011, page 86).

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the facility capital costs in a manner that would be inconsistent with the estimates provided for the Sheep Mountain project. If additional uranium ore production is to be modeled, a second (or more) and identical heap leach facility should be assumed, either concurrently or sequentially with the first facility.

- Consistent with the Sheep Mountain project cost assumptions, capital investment, totaling $14.177 million, was assumed during the operational period to add more heap leach pads and to replace underground mine equipment. Two additional heap pads were assumed, the first after approximately one-third of the ore is processed, and the second after two-thirds is processed.

- Ore grades were 0.142% and 0.086% for underground and open-pit mined uranium, based on data from the EIA (EIA 2010, Table 2). The Sheep Mountain project's ore

grades averaged 0.132% for underground and 0.085% for open-pit produced uranium (BRS 2011, page 86).

- The U_3O_8 recovery rate varied between 89% and 92%, depending on the year of operation, as per the Sheep Mountain project (BRS 2011, page 86).

- The cost of open pit mining is $19.28 per ton of ore, while the cost of underground mining is $52.24 per ton, and the cost of heap leach processing is $13.51 per ton (BRS 2011, pages 87 and 88).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $125 million has an annual interest rate of 4%, with a 15-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 20 presents the cost estimates developed for the heap leach facility.

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Resource mined (1,000 tons)			
Open Pit	2,895	N.C.	N.C.
Underground	3,498	N.C.	N.C.
U_3O_8 Recovered (1,000 lb)	13,558	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$881,266	$764,878	$643,637
Line of Credit (LoC)	$125,000	$136,591	$153,130
Open Pit Mine			
Capital Costs	$14,590	$14,590	$14,590
Operating Costs	$55,817	$49,594	$42,879
Underground Mine			
Capital Costs	$60,803	$59,880	$58,997
Operating Costs	$182,723	$156,753	$130,078
Heap Pads/Processing Plant			
Capital Costs	$51,885	$50,788	$49,690
Operating Costs	$86,367	$74,973	$63,130

Table 20: Heap Leach Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
Shared Costs			
Predevelopment	$10,630	$11,149	$11,874
Reclamation Costs	$17,000	$14,755	$12,416
Taxes, claims, and royalties	$101,346	$87,961	$74,018
Repay LoC/Finance Costs	$168,640	$146,659	$125,441
Total Cost	$749,801	$667,102	$583,114

Figure 18 end of year cash balance for the heap leach facility (as well as for the other uranium recovery facilities). Figure 18 shows that by production year 4, the heap leach facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the heap leach facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the heap leach facility consistently produces the largest quantity of U_3O_8 annually.

6.2.3 In-Situ Leach (Long) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Centennial project in Weld County, Colorado (SRK Consulting 2010b). The Centennial project is expected to have a production period of 14–15 years, which is a long duration for an ISL facility. Annual cost estimates for the Centennial project are provided on pages 117 through 123 of SRK Consulting 2010b. SRK Consulting 2010b, Section 17.11, discusses the basis for the Centennial project cost estimate. Specific assumptions used to develop the ISL (Long) facility base case cost estimate for this analysis include:

- The operating duration is 15 years, as per the Centennial project's uranium production schedule (SRK Consulting 2010b, pages 117 and 120). The facility produces about 700,000 lb of U_3O_8 annually in the first 12 years, then reduces production until only 92,000 lb is produced in the last (15^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Centennial project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Long) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010b, pages 17–24). Funds for restoration are set aside beginning in the second production year and continuing until the end of the project (i.e., year 19 after the start of production).

- The price for U_3O_8 is $65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of $85 million has an annual interest rate of 4%, with a 10-year payback period.
- Taxes, claims, and royalties total 11.5% of revenue.
- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 21 presents the cost estimates that were developed for the ISL (Long) facility.

Table 21: In-Situ Leach (Long) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	9,522	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$618,930	$501,943	$390,820
Line of Credit (LoC)	$85,000	$87,550	$90,950
Operating Cost Summary			
Central Plant/Ponds	$66,536	$52,000	$38,805
Satellite/Well Field	$126,708	$109,218	$90,279
Restoration	$11,257	$8,353	$5,844
Decommissioning	$14,818	$9,175	$5,017
G&A Labor	$16,379	$12,849	$9,732
Corporate Overhead	$6,350	$4,969	$3,761
Contingency	$48,410	$39,313	$30,687
Total Operating Costs	$290,458	$235,877	$184,124
Capital Cost Summary			
CPP/General Facilities	$55,097	$54,027	$52,739
Well Fields	$14,209	$13,868	$13,450
G&A	$13,605	$13,428	$13,212
Mine Closure	$12,585	$7,244	$3,555
Miscellaneous	$14,246	$11,055	$8,202
Contingency	$21,948	$19,924	$18,232
Total Capital Costs	$131,690	$119,546	$109,390
Severance, Royalty, Tax	$71,177	$57,723	$44,944
Repay LoC/Finance Costs	$104,797	$92,076	$78,758
Total Cost	$598,122	$505,223	$417,216

Figure 18 shows the end of year cash balance for the ISL (Long) facility (as well as for the other uranium recovery facilities). Figure 18 shows that by the second year of production, the ISL (Long) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Long) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Long) facility produces an annual

amount of U_3O_8 that is midway between the amounts produced by the conventional mill and heap leach facility.

6.2.4 In-Situ Leach (Short) Facility Cost Estimate

The base case economic costs for development of a new ISL facility were estimated using data from the proposed new Dewey-Burdock project in South Dakota (SRK Consulting 2010a). The Dewey-Burdock project is expected to have a production period of about 9 years, which is representative for an ISL facility. SRK Consulting 2010a, pages 96 through 105, presents annual cost estimates for the Dewey-Burdock project, and Section 17.11 of that report discusses the basis for the Dewey-Burdock project cost estimate. Specific assumptions used to develop the ISL (Short) facility base case cost estimate for this analysis include:

- The operating duration is 9 years, as per the Dewey-Burdock project's uranium production schedule (SRK Consulting 2010a, pages 117 and 120). The facility produces about 1,010,000 lb of U_3O_8 annually in the first 6 years, then production declines until only 533,000 lb is produced in the last (9^{th}) year.

- The U_3O_8 production rates were not adjusted to achieve equivalent production rates with the other types of facilities because to do so might affect the ISL facility capital costs in a manner that would be inconsistent with the estimates provided for the Dewey-Burdock project. If additional U_3O_8 production is to be modeled, a second (or more) and identical ISL (Short) facility should be assumed, either concurrently or sequentially with the first facility.

- Ground water restoration of a mining unit is assumed to begin as soon as practicable after mining in the unit is complete (SRK Consulting 2010a, pages 17–18). Funds for restoration are set aside beginning in the first production year and continuing for 2 years after production ends (i.e., production year 11).

- The price for U_3O_8 is \$65 per pound (SRK Consulting 2010a, SRK Consulting 2010b, Berger 2009).

- An LoC of \$70 million has an annual interest rate of 4%, with a 5-year payback period.

- Taxes, claims, and royalties total 11.5% of revenue.

- The discount rates are 3% and 7%, consistent with EPA's economic analysis guidelines (EPA 2010).

Table 22 presents the cost estimates developed for the ISL (Short) facility.

Table 22: In-Situ Leach (Short) Facility Cost Estimate

Component	Discount Rate		
	None	3%	7%
U_3O_8 Recovered (1,000 lb)	8,408	N.C.	N.C.
	Revenues/Costs ($1,000)		
Gross Revenue on U_3O_8	$546,520	$491,065	$431,098
Line of Credit (LoC)	$70,000	$72,100	$74,900
Operating Cost Summary			
Central Plant/Ponds	$31,036	$27,485	$23,754
Satellite/Well Field	$130,056	$116,074	$100,788
Restoration	$6,159	$5,207	$4,234
Decommissioning	$11,614	$8,594	$5,835
G&A Labor	$9,750	$8,637	$7,500
Corporate Overhead	$3,900	$3,450	$2,994
Contingency	$38,503	$33,889	$29,021
Total Operating Costs	$208,558	$186,696	$162,811
Capital Cost Summary			
CPP/General Facilities	$49,338	$50,297	$51,598
Well Fields	$37,127	$36,951	$36,787
G&A	$2,507	$2,463	$2,414
Mine Closure	$22,460	$16,640	$11,314
Miscellaneous	$9,565	$8,253	$6,927
Contingency	$19,707	$19,593	$19,545
Total Capital Costs	$140,705	$134,197	$128,586
Severance, Royalty, Tax	$83,444	$74,899	$65,698
Repay LoC/Finance Costs	$78,619	$74,171	$68,984
Total Cost	$511,326	$469,963	$426,079

Figure 18 shows the end of year cash balance for the ISL (Short) facility (as well as for the other uranium recovery facilities). Figure 18 shows that in its first year of production, the ISL (Short) facility has a positive cash balance. Figure 19 shows the assumed annual U_3O_8 production from the ISL (Short) facility (as well as from the other uranium recovery facilities). Based on the assumptions used for the base case, the ISL (Short) facility produces an annual amount of U_3O_8 that is midway between the amounts produced by the ISL (Long) and heap leach facilities.

6.2.5 Cost Estimate Sensitivities

The uranium recovery facility base case cost estimates developed in Sections 6.2.1 through 6.2.4 were based on the specific assumptions presented in each section. One of the key parameters for the determination of the conventional mill and heap leach facility cost estimates is the assumed ore grade. Table 23 presents the average ore grades reported by the EIA for U.S.-origin uranium during 2009. These are the ore grades assumed for the conventional mill and heap leach facility cost estimates. As noted in Section 6.2.2, the ore grades assumed in the Sheep Mountain project

cost estimate (BRS 2011) were very similar to the Table 23 values. However, as noted in Section 6.2.1, the Piñon Ridge project cost estimate used an ore grade of 0.23%, which is considerably higher than the Table 23 EIA values (Edge 2009).

Table 23: Uranium Ore Grade

Mine Type	Ore Output (1,000 tons)	Ore Grade
Underground	76,000	0.142%
Open Pit	54,000	0.086%
In-Situ Leach	145,000	0.08%
Total	275,000	0.10%

Source: EIA 2011b

Table 24 summarizes the cost estimates for all four uranium recovery facilities developed in Sections 6.2.1 through 6.2.4. It includes the heap leach facility and conventional mill sensitivity cost estimates based on the alternate ore grade and ore processing assumptions just described.

Table 24: U_3O_8 Market Value and Cost to Produce (Nondiscounted)

Average U_3O_8 Price ($/lb)	$65.00	
Average U_3O_8 Cost ($/lb)	w/ LoC[1]	w/o LoC[2]
Conventional	$51.56	$47.24
ISL (Long)	$53.89	$51.81
ISL (Short)	$52.49	$51.46
Heap Leach	$46.08	$42.87
Conventional as Designed	$26.57	$25.45
Heap Leach w/ High Grade Ore	$22.13	$20.59

1 Total cost minus LoC revenue divided by the pounds of U_3O_8 produced
2 Total cost minus LoC revenue minus finance charge divided by the pounds of U_3O_8 produced.

The Piñon Ridge mill is being designed to process 1,000 tpd of uranium ore but, because of current market conditions, is currently being licensed to process only 500 tpd. The cost estimate in Section 6.2.1 is based on a conventional mill processing 500 tpd. As an alternative, the conventional mill cost estimate is recalculated using an ore grade of 0.23% and an ore processing rate of 1,000 tpd. These results have been included in Table 24.

So that the facilities maintain a positive cash flow, the analyses in Sections 6.2.1 through 6.2.4 assumed that each facility would be provided with an LoC to cover the construction and development costs. The amount of the LoC was determined by how much cash was necessary to maintain a positive cash balance. The interest on the LoC was assumed to be 4%, and the period to repay the LoC varied for each facility, depending on the amount of the LoC. The interest paid on the LoC is included in the facility cost estimates developed in Sections 6.2.1 through 6.2.4.

The right hand column of Table 24 shows what the facility-specific cost estimates would be without an LoC (and if the cash flow was allowed to be negative), or if the interest rate was 0%.

Figure 20 shows the effect of alternative assumptions on the cash balance.

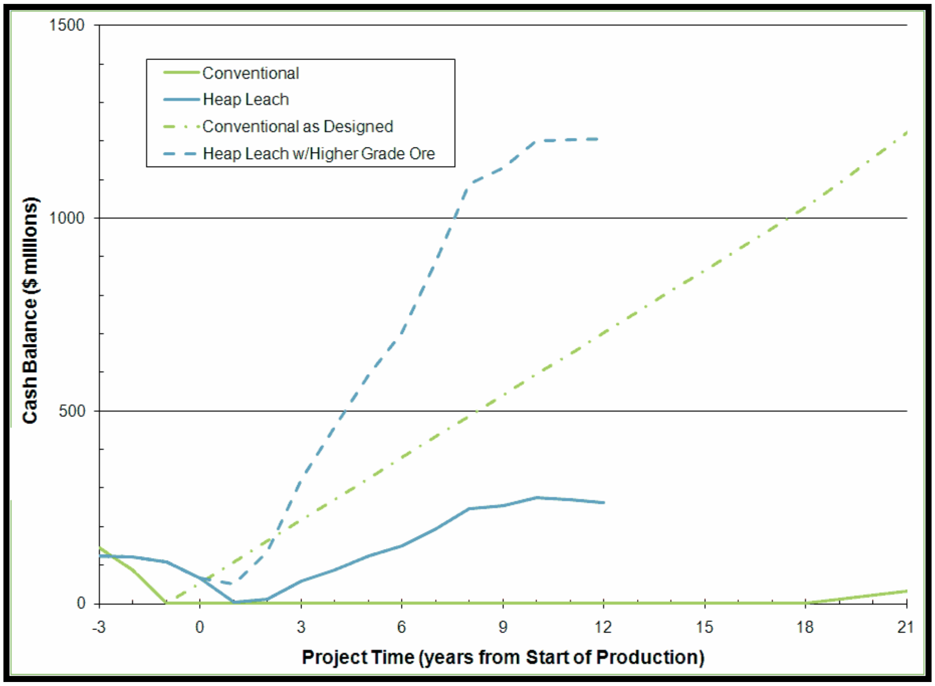


Figure 20: Estimated Cash Balance – Sensitivity Cases

Figure 21 shows the effect of the alternative assumptions on the U_3O_8 production. The obvious conclusion is that the higher the ore grade, the more U_3O_8 is produced, and therefore, the uranium recovery facility is more profitable.

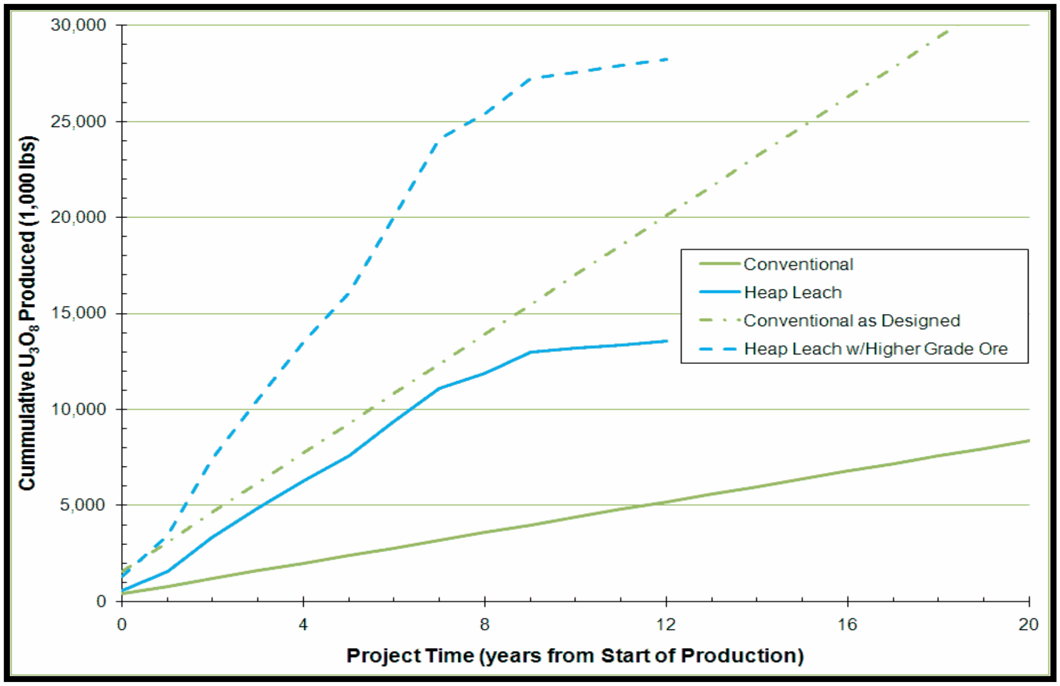


Figure 21: Cumulative U_3O_8 Projections – Sensitivity Cases

6.2.6 Annual Total U_3O_8 Cost Estimates

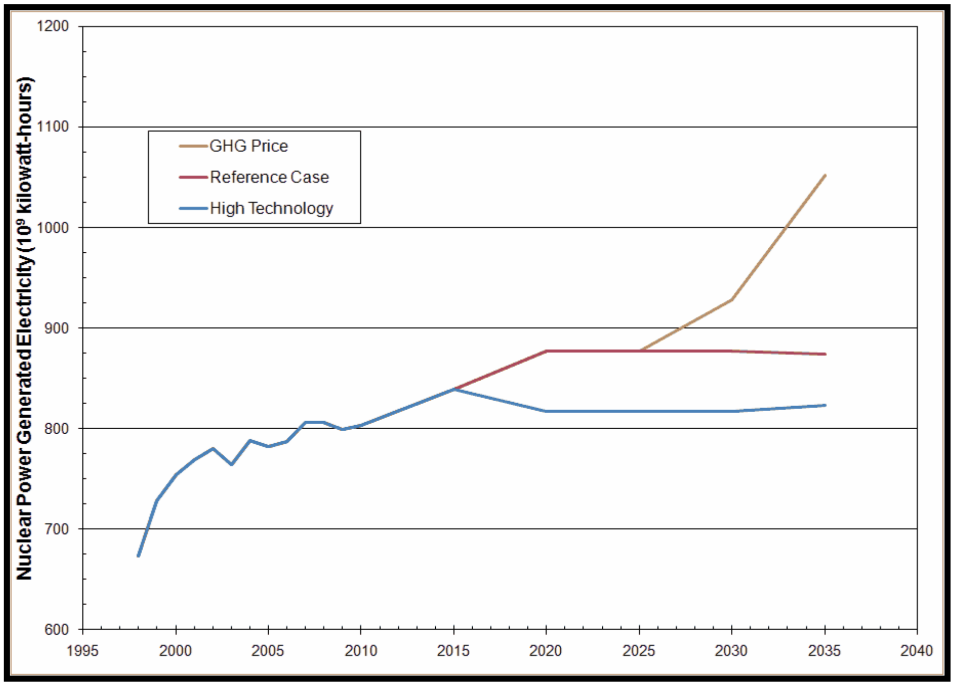
In Sections 6.2.1 through 6.2.4, base case cost estimates were developed for a conventional mill, a heap leach facility, and two ISL facilities. These individual uranium recovery facility cost estimates are used together with the actual 2009 (the last year for which data are available) and projected 2035 U.S.-origin uranium production.

For 2009, the EIA reports that 7,100 thousand pounds of U_3O_8 was produced in the United States (EIA 2011b). For this analysis, the total produced was divided between conventional mills and ISL facilities using the EIA-provided ore outputs, shown in Table 23, which resulted in 3,356,000 lb for conventional mills and 3,744,000 lb for ISL facilities. No heap leach facilities were operating in 2009, so the heap leach production is zero. The 2009 uranium recovery facility total cost and revenue estimates given in Table 18 (page 75) are based on these U_3O_8 production figures and the individual facility unit cost estimates given in Table 24.

These calculated 2009 economic data are based on 2011 dollars (e.g., \$65 per pound of U_3O_8). The 2009 calculated economic data are adjusted to 2009 dollars by assuming an average U_3O_8 price of \$48.92 lb^{-1} (EIA 2010) and adjusting the costs by the ratio of the 2009 energy consumer price index (CPI, 202.301) to the 2011 energy CPI (252.661) (BLS 2011, Table 25). Table 18 (page 75) also gives the 2009 economic data estimates based on 2009 dollars for uranium recovery facilities.

The next part of the analysis was to estimate the future value of the U.S. uranium recovery industry. To this end, it was necessary to estimate the future size of the nuclear power industry. The EIA (2011a) analyzed the U.S. energy outlook for 2011 and beyond, including the contribution from nuclear power. The EIA analyzed a reference case, plus 46 alternative cases,

and determined the nuclear power contribution for each. The EIA reported that in 2010, nuclear power produced 803×10^9 kilowatt-hours of electricity and projected that for the reference case, nuclear power would produce 874×10^9 kilowatt-hours in 2035 (EIA 2011a). Of the 46 alternative cases, the Greenhouse Gas (GHG) Price Economywide and Integrated High Technology cases had the largest and smallest projected nuclear power contributions in 2035, respectively. The GHG Price Economywide case was projected to contribute $1{,}052 \times 10^9$ kilowatt-hours in 2035, while the Integrated High Technology case was projected to contribute 823×10^9 kilowatt-hours. Figure 22 shows and compares the EIA projections.



Source: EIA 2011a

Figure 22: Nuclear-Generated Electricity Projections

It is assumed that the 2035 to 2009 U_3O_8 requirements would have the same ratio as the 2035 to 2010 EIA (2011a) nuclear power estimates. Thus, for the EIA Reference Nuclear, Low Nuclear Production (Integrated High Technology), and High Nuclear Production (GHG Price Economywide) cases, the total U_3O_8 requirements in 2035 are estimated to be 7,728, 7,277, and 9,302 thousand pounds, respectively. Costs were estimated for four cases, with each case assuming a different type of uranium recovery facility responsible for producing the required U_3O_8. The cases are (1) only conventional mills, (2) only ISL facilities, (3) only heap leach facilities, and (4) a mixture of all three types of facilities.

To divide the total U_3O_8 requirement among the three types of uranium recovery facilities for Case 4, it is assumed that one reference heap leach facility would be operational, and that the remainder of the U_3O_8 would be divided between conventional mills and ISL facilities with the same ratio as in 2009. The total amount of U.S.-origin U_3O_8 for each of the 2035 projections is shown in Table 25 for Case 4. For the remaining three cases, the total 2035 projections given in Table 25 were assumed to be produced by the particular mine type associated with the case.

Table 25: Assumed Case 4 U_3O_8 Production Breakdown by Mine Type

Mine Type	U_3O_8 Produced (1,000 lb)				
	2009	2035 Projections			
		Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
Conventional	3,356	3,159	2,947	3,903	4,642
In-Situ Leach	3,744	3,525	3,287	4,355	5,178
Heap Leach	—	1,043	1,043	1,043	1,043
Total	7,100	7,728	7,277	9,302	10,862

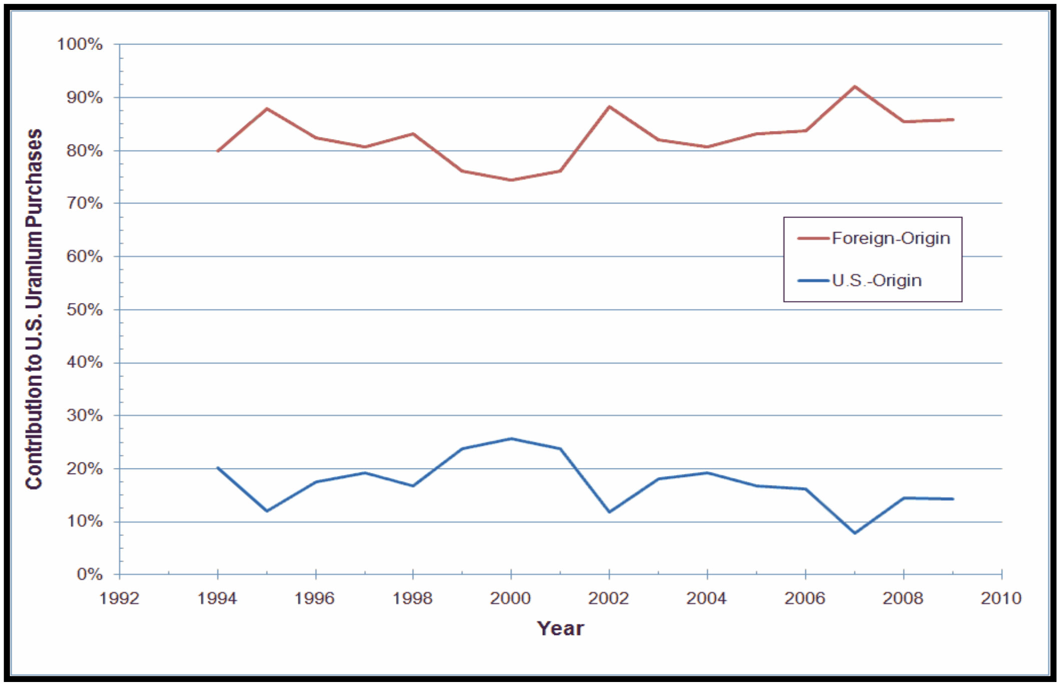
Source: EIA 2011b

The 2035 total cost and revenue estimates for uranium recovery facilities appear in Table 18 (page 75) and are based on the Table 25 U_3O_8 productions and the individual facility unit cost estimates given in Table 24. Refer to Section 6.2 for a discussion of the Table 18 total cost and revenue estimates. Table 26 gives a breakdown by facility type for Case 4, the mixed uranium recovery facility case.

Table 26: Case 4 (Mixed Uranium Recovery Facilities) Economic Projections (Nondiscounted)

Cost/Revenue	2035 Projections ($1,000)			
	Reference Nuclear	Low Nuclear Production	High Nuclear Production	Ref Low Import
U_3O_8 Revenue	$502,305	$472,994	$604,605	$706,057
Conventional	$205,407	$191,551	$253,767	$301,726
In-Situ Leach	$229,108	$213,653	$283,048	$336,541
Heap Leach	$67,790	$67,790	$67,790	$67,790
U_3O_8 Cost	$391,584	$368,411	$472,461	$552,668
Conventional	$162,932	$151,941	$201,292	$239,334
In-Situ Leach	$180,590	$168,409	$223,108	$265,273
Heap Leach	$48,062	$48,062	$48,062	$48,062

The EIA (2010, Table S1a) shows that most of the U_3O_8 purchased in the United States is of foreign origin (see Figure 23). In 2009, the 7,100 thousand pounds of U_3O_8 produced in the United States amounted to only 14.2% of the total amount of U_3O_8 purchased. Since the total cost and revenue estimates in Table 18 (page 75) are based on the 2009 U.S.-produced U_3O_8, then those estimates include the assumption that 85.8% of the U.S.-purchased U_3O_8 is of foreign origin. As Figure 23 shows, the amount of foreign origin U_3O_8 has fluctuated over time. If all of the U_3O_8 that is purchased in the United States were to be supplied domestically, then the total cost and revenue estimates shown in Table 18 would increase by a factor of 7 (i.e., 1/0.142 = 7). However, this is considered to be unrealistic and is unsupported by the data shown in Figure 23. As an alternative, the Ref Low Import case shown in Table 18 assumes that 20% of the 2035 EIA Reference case U_3O_8 needs would be met domestically.



Source: EIA 2010, Table S1a

Figure 23: U.S. and Foreign Contribution to U_3O_8 Purchases

6.3 Economic Assessment of Proposed GACT Standards

EPA is proposing to revise Subpart W by introducing three categories related to how uranium recovery facilities manage byproduct materials during and after the processing of uranium ore. are presented and described in Section 5.4 presents and describes the proposed GACTs for each category. This section presents the costs and benefits associated with the implementation of the various components of the GACTs. The first category is the standards for conventional mill tailings impoundments. The second category consists of requirements for nonconventional impoundments where uranium byproduct material (i.e., tailings) is contained in ponds and covered by liquids. Examples of this category are evaporation or holding ponds that exist at conventional mills and ISR and heap leach facilities. Requirements in this second category are that the nonconventional impoundments be provided with a double liner (Section 6.3.2) and that liquid at a depth of 1 meter be maintained in the impoundment (Section 6.3.3). The third category of revised Subpart W would require that heap leach piles be provided with a double liner (Section 6.3.4) and that the pile's moisture content be maintained above 30% by weight (Section 6.3.5). Additionally, the revised Subpart W would remove the requirement to monitor the radon flux at conventional facilities constructed on or prior to December 15, 1989 (Section 6.3.1).

6.3.1 Method 115, Radon Flux Monitoring

Existing Subpart W regulations require licensees to perform annual monitoring using Method 115 to demonstrate that the radon flux at conventional impoundments constructed before December 15, 1989, is below 20 pCi/(m^2-sec). The elimination of this monitoring requirement

would result in cost savings for the three facilities to which this requirement still applies: Sweetwater, White Mesa, and Shootaring Canyon.[9]

Radon Flux Monitoring Unit Costs

Method 115 requires that multiple large-area activated charcoal collectors (LAACCs) be employed to make radon flux measurements. The first step in preparing this cost estimate was to develop the cost for making a single LAACC radon flux measurement. Unit cost data for performing LAACC radon flux measurements were obtained from three primary sources: the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (EPA 2000a), KBC Engineers (KBC 2009), and Waste Control Specialists (WCS 2007). Weston Solutions provided fully loaded billing rates for radiation safety officers (RSOs) and certified health physicists (CHPs) (WS 2003).

MARSSIM (EPA 2000a)—MARSSIM is a multivolume document that presents methodologies for performing radiation surveys. Appendix H to MARSSIM describes field survey and laboratory analysis equipment, including the estimated cost per measurement. Included in Appendix H is the cost estimate for performing an LAACC measurement. The MARSSIM estimated cost range for LAACC radon flux measurements is \$20 to \$50 per measurement, including the cost of the canister. Since MARSSIM, Revision 1, was published in August 2000, it is assumed that this cost estimate is in 2000 dollars. MARSSIM does not estimate the cost for deploying the canisters or for final report preparation.

KBC Engineers (KBC 2009)—In November 2009, KBC Engineers prepared a revised "Surety Rebaselining Report" for the Kennecott Uranium Company's Sweetwater Uranium Project, which included an estimate for the cost of performing Method 115 radon flux monitoring. KBC based the canister testing cost of \$50 per canister on past invoices received from Energy Laboratories, Inc. (a commercial analytical laboratory). In addition to the cost for the laboratory work, KBC included estimates for setting up and retrieving canisters in the field and for data analysis and report preparation. KBC estimated that a technician/engineer with a fully loaded billing rate of \$100 per hour would require 40 hours to set up and retrieve 110 canisters, or \$36.36 per canister. Also, KBC estimated that an engineer/scientist with a fully loaded billing rate of \$105 per hour would require 20 hours for data analysis and report preparation for the 110 canisters, or \$19.06 per canister. The KBC unit cost estimates are in 2009 dollars.

Waste Control Specialists (WCS 2007)—In its application to construct and operate a byproduct material disposal facility,[10] Waste Control Specialists, LLC (WCS) included a closure plan and corresponding cost estimate. As part of the final status survey, the radon flux through the disposal unit cap will be measured using LAACCs. WCS used the MARSSIM value as the cost for testing the canister. In addition, WCS included the cost of an RSO at \$75 per hour to conduct the survey and prepare report and the cost of a CHP at \$104 per hour to review the survey data. For the 100 canisters assumed, WCS assumed the RSO would require 40 hours for a cost of \$30

[9] Cotter Corporation has indicated that the primary impoundments at its Cañon City site are no longer active, and thus, it has stopped performing Subpart W radon flux monitoring at that site (Thompson 2010).

[10] The WCS facility is not a conventional tailings facility or a uranium recovery facility. It was specially constructed to handle the K-65 residues that were stored at DOE's Fernald site.

per canister and the CHP would require 10 hours, or $10.40 per canister. The WCS unit costs are in 2004 dollars.

Weston Solutions (WS 2003)—Weston Solutions did not estimate the cost associated with Method 115 radon flux monitoring, but it did include the fully loaded hourly billing rates for radiation supervisors (equivalent to RSOs) and CHPs of $78 and $133, respectively. These billing rates are in 2003 dollars.

Unit Costs—Table 27 summarizes the data provided in the four source documents. The first step was to adjust all of the data to constant 2011 dollars. The CPI (DOL 2012) was used to make this adjustment. The right side of Table 27 shows the adjusted cost data.

Table 27: Data Used to Develop Method 115 Unit Costs

Data as Provided						Adjusted to November 2011 (CPI = 226.23)		
Source	Date	CPI	Cost per Canister			Cost per Canister		
			Testing	Setup/ RSO	Analysis/ CHP	Testing	Setup/ RSO	Analysis/ CHP
EPA 2000a	Aug-00	172.8	$20.00	N.G.	N.G.	$26.18	N.G.	N.G.
			$50.00	N.G.	N.G.	$65.46	N.G.	N.G.
WS 2003	Dec-03	184.3	N.G.	$31.20	$13.30	N.G.	$38.30	$16.33
WCS 2007	May-07	207.949	$25.00	$30.00	$10.40	$27.20	$32.64	$11.31
			$50.00			$54.40		
KBC 2009	Nov-09	216.33	$50.00	$36.36	$19.09	$52.29	$38.03	$19.96

N.G. = not given in the source document

Based on the data from Table 27, minimum, average, and maximum unit costs for performing Method 115 radon flux monitoring were estimated and are shown in Table 28.

Table 28: Method 115 Unit Costs

Type	LAACC Unit Cost ($/Canister)			
	Testing	Setup/RSO	Analysis/CHP	Total
Minimum	$26.18	$32.64	$11.31	$70.14
Average	$45.11	$36.32	$15.87	$97.29
Maximum	$65.46	$38.30	$19.96	$123.72

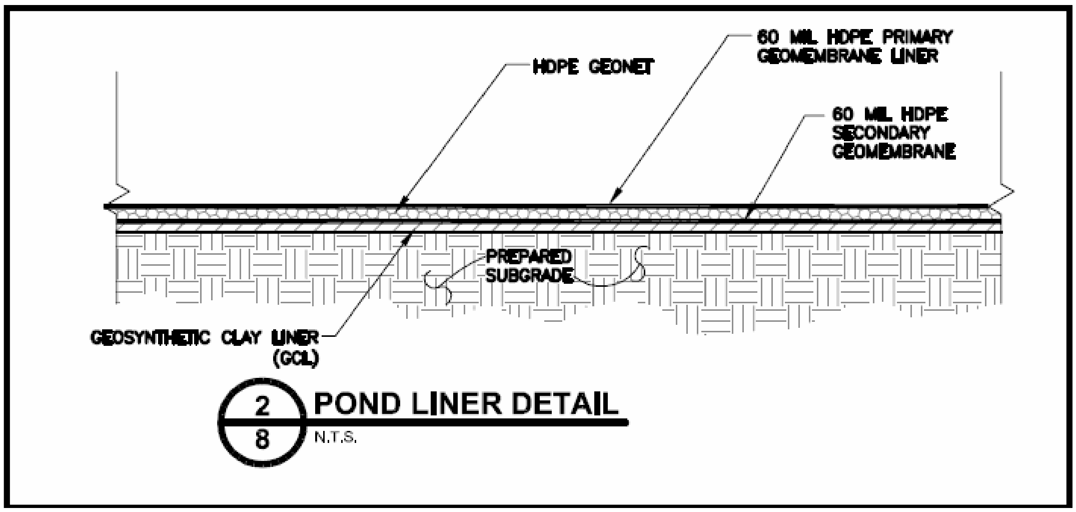
Total Annual Cost Savings (Benefit)

Method 115 requires 100 measurements per year as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. Additionally, if there are exposed beaches or soil-covered areas (as is likely at White Mesa), then an additional 100 measurements are necessary. Thus, for the three sites still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring (based on the Table 28 LAACC unit costs) is estimated to be about $9,730 per site per year for Shootaring and

Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 yr^{-1}, with a range from approximately $28,000 to $49,500 yr^{-1}.

6.3.2 Double Liners for Nonconventional Impoundments

Uranium byproduct materials are often stored in onsite impoundments at uranium recovery facilities, including in holding ponds and evaporation ponds. These ponds can be collectively referred to as nonconventional impoundments, to distinguish them from conventional tailings impoundments. This section provides an estimate of the cost to provide these nonconventional impoundments with a double liner, including a leak collection layer. Figure 24 shows a typical design of an impoundment double liner.



Source: Golder 2008, Drawing 8

Figure 24: Typical Double-Lined Impoundment with Leak Collection Layer

Double Liner Unit Costs

Unit costs, per square foot of liner, have been estimated for the three components of the double liner system: the geomembrane (HDPE) liner, the drainage (Geonet) layer, and the geosynthetic clay liner (GCL).

HDPE Unit Cost—The geomembrane (HDPE) liner installation unit cost estimates shown in Table 29 were obtained from the indicated documents and Internet sites. The Table 29 unit costs include all required labor, materials, and manufacturing quality assurance documentation costs (Cardinal 2000, VDEQ 2000). Where necessary, the unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 29 geomembrane (HDPE) liner mean unit cost is $0.95 ft^{-2}, the median cost is $0.74 ft^{-2}, while the minimum and maximum costs are $0.45 and $2.35, respectively.

Table 29: Geomembrane (HDPE) Liner Unit Costs

Data Source	Unit Cost (ft^{-2})		Thickness - Area
	As Given	2011$	
Foldager 2003	$0.37	$0.45	Not Specified
Vector 2006	$0.45	$0.50	60 mil
Cardinal 2000	$0.39	$0.51	60 mil - 470,800 SF
Cardinal 2000	$0.40	$0.52	60 mil - 138,920 SF
Earth Tech 2002	$0.45	$0.57	60 mil
Cardinal 2000	$0.47	$0.61	60 mil - 118,800 SF
VDEQ 2000	$0.48	$0.63	60 mil
Duffy 2005	$0.60	$0.70	40 mil
Get-a-Quote	$0.70	$0.70	40 mil
Cardinal 2000	$0.54	$0.71	60 mil - 60,600 SF
MWH 2008	$0.70	$0.74	40 mil
Project Navigator 2007	$0.70	$0.76	60 mil
MWH 2008	$0.80	$0.84	80 mil
Get-a-Quote	$0.86	$0.86	60 mil
EPA 2004	$0.80	$0.96	60 mil
Get-a-Quote	$1.04	$1.04	80 mil
Free Construction	$1.05	$1.05	40 mil
Free Construction	$1.69	$1.69	60 mil
Foldager 2003	$1.40	$1.72	Not Specified
Free Construction	$2.00	$2.00	80 mil
Lyntek 2011	$2.35	$2.35	80 mil

Drainage Layer (Geonet) Unit Cost—Some of the documents reviewed included unit cost estimates for installation of the drainage (Geonet) layer, as shown in Table 30. As with the geomembrane (HDPE) liner unit costs, the drainage (Geonet) layer unit costs were adjusted from the year they were estimated to year 2011 dollars using the CPI. The Table 30 drainage layer (Geonet) mean unit cost is \$0.64 ft^{-2}, the median cost is \$0.57 ft^{-2}, while the minimum and maximum costs are \$0.48 and \$1.02, respectively.

Table 30: Drainage Layer (Geonet) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
EPA 2004	$0.40	$0.48
Project Navigator 2007	$0.45	$0.49
Earth Tech 2002	$0.45	$0.57
MWH 2008	$0.60	$0.63
Duffy 2005	$0.88	$1.02

Geosynthetic Clay Liner (GCL) Unit Cost—Some of the documents reviewed also included unit cost estimates for installation of the GCL, as shown in Table 31. As for the geomembrane (HDPE) liner unit costs, the CPI was used to adjust the GCL unit costs from the year they were estimated to year 2011 dollars. The Table 31 GCL mean unit cost is \$0.69 ft^{-2}; the median cost is \$0.65 ft^{-2}; and the minimum and maximum costs are \$0.45 and \$1.12, respectively.

Table 31: Geosynthetic Clay Liner (GCL) Unit Costs

Data Source	Unit Cost (ft^{-2})	
	As Given	2011$
Vector 2006	\$0.40	\$0.45
EPA 2004	\$0.40	\$0.48
Earth Tech 2002	\$0.52	\$0.65
Project Navigator 2007	\$0.70	\$0.76
Lyntex 2011	\$1.12	\$1.12

Some designs may choose to use a compacted clay layer beneath the double liner (e.g., Figure 26). However, Sandia (1998) has found that "[r]eplacing the 60 cm thick clay (amended soil) barrier layer with a GCL drastically reduced the cost and difficulty of construction." This savings was due to avoiding the expense of obtaining the bentonite clay and the difficulties of the clay being "sticky to spread and slippery to drive on," plus "compaction was extremely difficult to achieve." For these reasons, it is believed that GCL will be used in most future applications and is thus appropriate for this cost estimate.

Design and Engineering—The cost estimates include a 20% allowance for design and engineering for the mean and median estimates, and a 10% and 20% allowance for the minimum and maximum estimates, respectively. The design and engineering cost has been calculated by multiplying the capital and installation cost by the allowance factor.

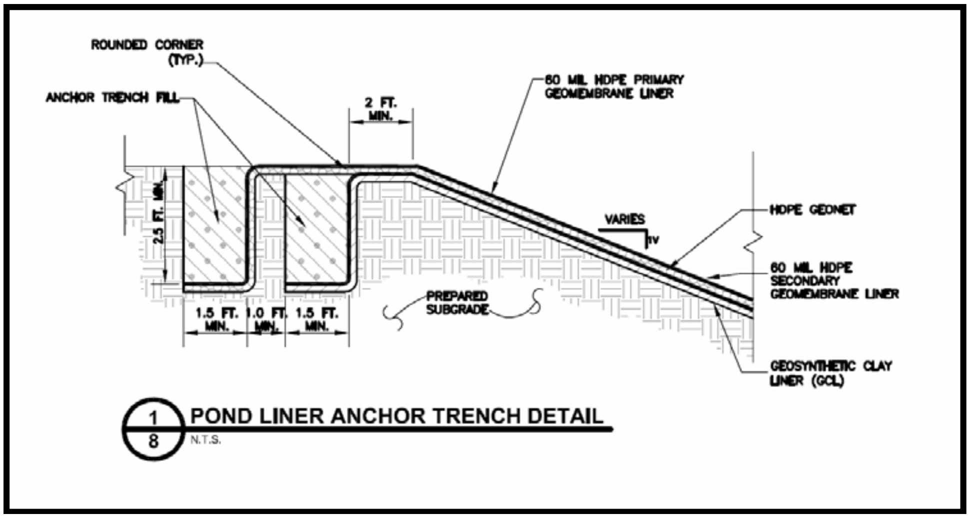
Contractor Oversight—The cost estimates include a 20% allowance for contractor oversight for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The contractor oversight cost has been calculated by multiplying the capital and installation cost by the allowance factor.

Overhead and Profit—The cost estimates include a 20% allowance for overhead and profit for the mean and median estimates, and a 15% and 25% allowance for the minimum and maximum estimates, respectively. The overhead cost and profit has been calculated by multiplying the sum of the capital and installation, design and engineering, and contractor oversight costs by the allowance factor.

Contingency—The cost estimates include a contingency factor of 20% for the mean and median estimates, and 15% and 25% for the minimum and maximum estimates, respectively. The contingency has been calculated by multiplying the sum of all of the other costs by the contingency factor.

Double Liner Capital and Installation Cost

Impoundment Areas—Figure 25 shows that in order to anchor the upper liner and drainage layer (Geonet), an additional 8.5 ft of material is required on each side of the impoundment. Similarly, an additional 6 ft of material is required on each side of the impoundment to anchor the lower liner and the GCL.



Source: Golder 2008, Drawing 8

Figure 25: Typical Double Liner Anchor System

Section 6.2 describes base facilities for each type of uranium recovery facility: conventional, ISR, and heap leach. Since they are not given in Section 6.2, Table 32 shows the impoundment surface areas for each of the base facilities, plus the areas of the upper liner, drainage layer (Geonet), lower liner, and GCL. The liner areas include additional material in order to anchor the liner, plus an additional 10% to account for the sloping of the sides and waste.

Table 32: Nonconventional Impoundment Areas

Facility Type	Impoundment Type	Number	Area (acres)		
			Surface	Upper Liner & Geonet	Lower Liner & GCL
Conventional (Golder 2008)	Evaporation	10	4.13	4.94	4.82
	Total	10	41.30	49.39	48.22
ISR (Powertech 2009)	Water Storage	10	7.20	8.41	8.26
	Process Water	1	3.31	3.98	3.88
	Total	11	75.31	88.05	86.50
Heap (Titan 2011)	Raffinate	1	0.9	1.17	1.11
	Collection	1	1.5	1.88	1.81
	Evaporation	1	5.7	6.71	6.58
	Total	3	8.10	9.75	9.50

Impoundment Double Liner Cost—Based on the above estimated quantities of material and unit costs, Table 33 presents the median, minimum, and maximum capital costs for installing the

double liner beneath the impoundments of each of the three types of uranium recovery facilities: conventional, ISR, and heap leach.

Table 33: Base Facility Nonconventional Impoundment Double Liner Capital and Installation Costs

Cost Type	Conventional	ISR	Heap
Mean	$13,800,000	$24,700,000	$2,700,000
Median	$11,500,000	$20,600,000	$2,300,000
Minimum	$6,500,000	$11,600,000	$1,300,000
Maximum	$32,900,000	$58,900,000	$6,500,000
Mean, w/o Upper Liner	$6,800,000	$12,100,000	$1,300,000

To demonstrate the individual component contribution to the total capital and installation cost, Table 34 presents the calculated mean capital cost breakdown by category.

Table 34: Mean Base Facility Nonconventional Impoundment Double Liner Capital and Installation Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Impoundment Double Liner Capital and Installation Cost		
		Conventional	ISR	Heap
Upper Liner	$0.95	$2,040,654	$3,638,014	$402,799
Drainage (Geonet)	$0.64	$1,370,814	$2,443,844	$270,581
Lower Liner	$0.95	$1,992,191	$3,573,958	$392,414
GCL	$0.69	$1,455,818	$2,611,714	$286,761
Design & Engineering	20%	$1,371,895	$2,453,506	$270,511
Contractor Oversight	20%	$1,371,895	$2,453,506	$270,511
Overhead & Profit	20%	$1,920,654	$3,434,908	$378,715
Contingency	20%	$2,304,784	$4,121,890	$454,459
Total	—	$13,828,706	$24,731,338	$2,726,751

Table 33 includes capital and annual cost estimates for a mean, without upper liner case. This case was added because, even if not required to comply with 40 CFR 192.32(a)(1), the design of nonconventional impoundments at uranium recovery facilities would include at least a single liner. The reason is that the NRC, in 10 CFR 40, Appendix A, Criterion 5(A), requires that "… surface impoundments (…) must have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water … ." Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

Double Liner Total Annual Cost

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb.

Table 35 presents the calculated annualized cost for installation of a double liner in a nonconventional impoundment for the 2035 projected U_3O_8 productions. The annualized cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of each uranium recovery facility, and then multiplying by the projected amount of U_3O_8 produced annually. Table 35 presents four cases. In the first three cases, it was assumed that a single type of uranium recovery facility would produce all of the U_3O_8 required in 2035, while in the fourth case, it was assumed that a mixture of uranium recovery facilities would be operating in 2035. For the fourth case, Table 25 gives the contribution to the total U_3O_8 required in 2035 by each type of facility.

Table 35: Projected Nonconventional Impoundment Double Liner Annualized Capital and Installation Costs

Cost Type	Projected 2035 U_3O_8 Production	Annualized Capital and Installation Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$6,700,000	$22,700,000	$1,600,000	$14,800,000
Median	Reference Nuclear	$5,600,000	$18,900,000	$1,400,000	$12,400,000
Minimum	Low Nuclear Production	$2,900,000	$10,000,000	$700,000	$6,500,000
Maximum	Reference Low Import	$22,400,000	$76,100,000	$5,500,000	$49,300,000
Mean, w/o Upper Liner	Reference Nuclear	$3,300,000	$11,100,000	$800,000	$7,300,000

In addition to the annualized capital and installation costs, the total annual cost includes the costs associated with the operation and maintenance (O&M) of the double liner. For the double liner, O&M would consist of daily inspection of the liner and repair of the liner when rips or tears are observed above the water level or when water is detected in the leak detection layer. Since daily inspections of the nonconventional impoundments are part of the routine operation of the uranium recovery facility (Visus 2009), the only additional O&M cost associated with the double liner would be the repair costs. It was assumed that the annual O&M cost for the nonconventional impoundments would be 0.5% of the total capital cost for installing the liners (MWH 2008 and Poulson 2010). Using the Table 33 base facility cost estimates for installation of the double liner, Table 36 shows the calculated double liner O&M costs for each base facility.

Table 36: Base Facility Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	O&M Allowance	Base Facility Annual O&M Cost ($/yr)		
		Conventional	ISR	Heap
Mean	0.5%	$68,000	$120,000	$13,000
Median	0.5%	$56,000	$100,000	$11,000
Minimum	0.25%	$16,000	$29,000	$3,200
Maximum	1.0%	$330,000	$590,000	$65,000
Mean, w/o Upper Liner	0.5%	$34,000	$61,000	$6,700

Table 37 shows annual O&M costs for the projected 2035 U_3O_8 productions. The Table 37 annual O&M costs were calculated by dividing the Table 36 costs by each base facility's annual U_3O_8 production and then multiplying by the projected 2035 U_3O_8 production.

Table 37: Projected Nonconventional Impoundment Double Liner Annual Operation and Maintenance Costs

Cost Type	Projected 2035 U_3O_8 Production	Annual Operation and Maintenance Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$1,300,000	$990,000	$50,000	$1,100,000
Median	Reference Nuclear	$1,100,000	$830,000	$39,000	$950,000
Minimum	Low Nuclear Production	$300,000	$230,000	$11,000	$250,000
Maximum	Reference Low Import	$9,000,000	$6,900,000	$330,000	$7,600,000
Mean, w/o Upper Liner	Reference Nuclear	$700,000	$500,000	$24,000	$560,000

The total annual cost for a double liner in a nonconventional impoundment is simply the sum of the annualized capital (Table 35) and installation cost plus the annual O&M cost (Table 37). Table 38 shows these total annual costs for the five cost types and four assumed uranium recovery facility cases.

Table 38: Projected Nonconventional Impoundment Double Liner Total Annual Costs

Cost Type	Projected 2035 U_3O_8 Production	Total Annual Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$8,000,000	$23,700,000	$1,700,000	$16,000,000
Median	Reference Nuclear	$6,700,000	$19,800,000	$1,400,000	$13,300,000
Minimum	Low Nuclear Production	$3,200,000	$10,200,000	$700,000	$6,800,000
Maximum	Reference Low Import	$31,400,000	$83,000,000	$5,800,000	$56,900,000
Mean, w/o Upper Liner	Reference Nuclear	$3,900,000	$11,700,000	$800,000	$7,800,000

Section 6.2, Table 18 (page 75), shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection. Table 39 compares those total U_3O_8 production costs to the double liner total costs given in Table 38. As Table 39 shows, the cost to install a double liner is less than 6% of the total cost to produce U_3O_8, while the cost to upgrade from a single liner to a double liner is less than 3% of the total cost.

Table 39: Comparison of Double Liner to Total U_3O_8 Production Costs

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)			Liner Contribution	
	Total Annual (Table 18)	Double Liner (Table 38)	Single to Double (Table 38)	Double Liner	Single to Double
Conventional	$398	$8.0	$3.9	2.0%	1.0%
In-Situ Leach	$411	$23.7	$11.7	5.8%	2.8%
Heap Leach	$356	$1.7	$0.8	0.5%	0.2%
Mixed Facilities	$396	$16.0	$7.8	4.0%	2.0%

Finally, the conventional, ISR, and heap leach base uranium recovery facilities (see Section 6.2) include a double liner, with drainage layer (Geonet) collection system for their onsite

impoundment designs. Thus, there is no additional cost for the Section 6.2 base uranium recovery facilities to meet the design and construction requirements at 40 CFR 192.32(a)(1) for onsite nonconventional impoundments.

Benefits from a Double Liner for a Nonconventional Impoundment

Including a double liner in the design of all onsite nonconventional impoundments that would contain uranium byproduct material would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, decision makers should consider this benefit because of the significance of ground water as a source of drinking water.

6.3.3 Maintaining 1 Meter of Water in Nonconventional Impoundments

As shown in Section 3.3.1, as long as a depth of approximately 1 meter of water is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine if there is any contribution above background radon values. This section estimates the cost to maintain 1 meter of water in the impoundment.

In order to maintain 1 meter, or any level, of water within a pond it is necessary to replace the water that is evaporated from the pond. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with makeup water supplied by the pond's operator. The replacement process is assumed to be required as part of the normal operation of the uranium recovery facility, which would occur regardless of the GACT. Thus, this cost estimate does not include process water replacement.

Unit Cost of Water

Three potential sources of pond makeup water were considered: municipal water suppliers, offsite non-drinking-water suppliers, and onsite water.

Municipal Water Supplier (Black & Veatch 2010)—In 2009/2010, a survey of the cost of water in the 50 largest U.S. cities was performed (Black & Veatch 2010). The survey compiled typical monthly bill data for three residential (3,750, 7,500, and 15,000 gallon/month), a commercial (100,000 gallon/month), and an industrial (10,000,000 gallon/month) water users. For this study, the commercial and industrial data were normalized to dollars per gallon, and the higher of the two values was used.

The survey found that the cost of water ranged from \$0.0012 gallon^{-1} in Sacramento, California, to \$0.0066 gallon^{-1} in Atlanta, Georgia, with a mean of \$0.0031 gallon^{-1} and a median of \$0.0030 gallon^{-1}. Looking at only those cities located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, and Texas; the survey included no cities in Utah or Wyoming), the survey found that the cost of water ranged from \$0.0016 gallon^{-1} in Albuquerque, New Mexico, to \$0.0045 gallon^{-1} in Austin, Texas, with a mean and median of \$0.0031 gallon^{-1}.

Offsite Non-Drinking-Water Suppliers (DOA 2004)—The water supplied by municipal water suppliers has been treated and is suitable for human consumption. It is not necessary for

impoundment evaporation makeup water to be drinking water grade. Therefore, using the data from the 50-city survey would likely overestimate the impoundment makeup water cost. Unfortunately, no data could be found as to the cost of non-drinking-water grade water for use as impoundment makeup water. However, another large scale use of non-drinking-water grade water is for crop irrigation, and the U.S. Department of Agriculture has compiled data on the cost of irrigation water for crops (DOA 2004).

For offsite sources of irrigation water, the Department of Agriculture states that the "31.6 million acre-feet of water received from off-farm water suppliers … cost irrigators $579 million, for an average cost of $18.29 per acre-foot of water …" (DOA 2004, page XXI), or $0.000056 gallon^{-1}.

Onsite Water (DOA 2004)—The Department of Agriculture identifies both wells (43.5 million acre-feet) and surface water (11.8 million acre-feet) as sources of onsite water. The cost for both sources is essentially the cost to pump the water from its source to where it is used. Unfortunately, the Department does not provide separate pumping costs for each onsite source, but instead states:

> *There were 497,443 irrigation pumps of all kinds used on 153,117 farms in 2003 irrigating 42.9 million acres of land. These pumps were powered by fuels and electricity costing irrigators a total of $1.55 billion or an average of $10,135 per farm. The principal energy source used was electricity, for which $953 million was spent to power 319,102 pumps that irrigated 24.1 million acres at an average cost of $39.50 per acre. Solar energy was reported as the source for pumping wells on 360 farms irrigating 16,430 acres.* [DOA 2004, page XXI]

From these data, it is possible to determine that the mean cost for pumping onsite water from both sources is $0.000086 gallon^{-1}. Also, on a per acre basis, the cost of using electricity to pump the water is slightly higher than the total average cost (i.e., $39.50 versus $36.13), and the use of solar energy to pump water is very rare (i.e., only about 0.03%).

Unit Costs—Table 40 shows the makeup water unit costs that have been estimated for this study. As described, the municipal water source costs are taken from Black & Veatch 2010, while the mean costs for offsite non-drinking and onsite water sources were taken from DOA 2004. All unit water costs were adjusted to 2011 dollars.

Although the Department of Agriculture did not present sufficient data to allow for the calculation of minimum, maximum, and median unit water costs, these costs were estimated by assuming that the cost of offsite non-drinking and onsite water sources have variation in costs similar to the variation in municipal supplier costs. Table 40 also shows these estimated makeup water unit costs.

Table 40: Makeup Water Unit Costs

Area	Source	Makeup Water Unit Costs ($gallon^{-1}$)			
		Minimum	Mean	Median	Maximum
United States	Municipal Supplier	$0.0013	$0.0033	$0.0032	$0.0069
	Offsite Non-Drinking	$0.000027	$0.000069	$0.000067	$0.000144
	Onsite Source	$0.000041	$0.00011	$0.00010	$0.00022
Potential Uranium Producing States (AZ, CO, NM, TX)	Municipal Supplier	$0.0017	$0.0032	$0.0033	$0.0047
	Offsite Non-Drinking	$0.000035	$0.000068	$0.000068	$0.000099
	Onsite Source	$0.000054	$0.00010	$0.00010	$0.00015

Additionally, Edge (2009) presents the discounted cost of estimated consumptive water use for the Piñon Ridge conventional mill. With 3% and 7% discount rates, the 40-year cost of water was presented as $58,545 and $33,766, respectively, which translates into an annual cost of $2,533. Edge (2009, page 7-2) indicates that the Piñon Ridge mill is estimated to use 227 acre-feet of water per year. This gives a water unit cost of $0.000034, which is consistent with the Table 40 offsite non-drinking and onsite water sources unit costs.

Total Annual Cost to Maintain 1 Meter of Water

Required Water Makeup Rate (Net Evaporation Rate)—As stated above, in order to maintain the water level within a nonconventional impoundment, it is necessary to replace the water that is evaporated from the impoundment. Some (and in some places all) of the evaporated water will be made up by naturally occurring precipitation. Figure 17 shows the annual evaporation (inches per year (in/yr)) of the lower 48 states, while Figure 16 shows the annual precipitation (in/yr). To determine the annual required water makeup rate, the Figure 16 data is simply subtracted from the Figure 17 data. A positive result indicates that evaporation is greater than precipitation, and makeup water must be supplied, whereas a negative result indicates that precipitation is sufficient to maintain the impoundment's water level.

The U.S. Army Corps of Engineers (ACE) has published net lake evaporation rates for 152 sites located in the United States (ACE 1979, Exhibit I). The ACE found that the net evaporation ranged from -35.6 in/yr in North Head, Washington, to 96.5 in/yr in Yuma, Arizona, with a mean of 10.8 in/yr and a median of 0.9 in/yr. At 82 sites, the evaporation rate exceeds the precipitation rate, and makeup water would be required to maintain the impoundment's water level.

Looking at only those 22 sites located within states potentially producing uranium (i.e., Arizona, Colorado, New Mexico, Texas, Utah, and Wyoming), the ACE found that the net evaporation rate ranged from 6.1 in/yr in Houston, Texas, to 96.5 in/yr in Yuma, Arizona, with a mean of 45.7 in/yr and a median of 41.3 in/yr. The evaporation rate exceeded the precipitation rate at all 22 sites in the potentially uranium-producing states included in the ACE study.

Uranium Recovery Facility Pond Size—As described in Section 6.2, a base facility was assumed for each of the three types of uranium recovery facilities. Table 41 gives information for each base facility that is necessary to calculate the annual makeup water cost (i.e., the surface area of the onsite impoundments and the annul U_3O_8 production).

Table 41: Summary of Base Facility Characteristics

Parameter		Conventional	ISR	Heap
Impoundment Surface Area	(acres)	41.3	75.3	8.1
U_3O_8 Production	(lb/yr)	400,000	930,000	2,200,000

Total Annual Cost—The only cost associated with maintaining the water level within the impoundment is the cost of the water. It is assumed that existing piping will connect the nonconventional impoundment to the water source, and that the water level will be visually checked at least once per day (Visus 2009).

The makeup water unit cost data from Table 40, the net evaporation rates from above (page 102), and the impoundment areas from Table 41 are combined to calculate annual makeup water cost estimates provided in Table 42.

Table 42: Base Facility Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)		
			Conventional	ISR	Heap
Mean	$0.00010	45.7	$5,313	$9,687	$1,042
Median	$0.00010	41.3	$4,840	$8,826	$949
Minimum	$0.000035	6.1	$240	$438	$47
Maximum	$0.00015	96.5	$16,337	$29,790	$3,204

The annual cost of makeup water from Table 42 was divided by the base facility U_3O_8 annual production rate from Table 41 to calculate the makeup water cost per pound of U_3O_8 produced, shown in Table 43.

Table 43: Base Facility Makeup Water Cost per Pound of U_3O_8

Cost Type	Makeup Water Cost ($/lb)		
	Conventional	ISR	Heap
Mean	$0.0133	$0.0104	$0.00047
Median	$0.0121	$0.0095	$0.00043
Minimum	$0.00060	$0.00047	$0.000021
Maximum	$0.041	$0.032	$0.0015

Section 6.2.6 (Table 25) provided projections of the U_3O_8 requirements in the year 2035 for four different nuclear usage scenarios: Reference Nuclear – 7,728,000 lb; Low Nuclear Production – 7,277,000 lb; High Nuclear Production – 9,302,000 lb; and Reference Low Import – 10,862 lb. Table 44 shows the makeup water costs which were calculated for the U_3O_8 production projected for 2035. The first three cost estimates assume that a single type of uranium recovery facility would be responsible for producing all of the projected U_3O_8, while the last estimates assume that a mix of uranium recovery type facilities is used, as described in Section 6.2.6.

Table 44: Projected Annual Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)			
		Conventional	ISR	Heap	Mix
Mean	Reference Nuclear	$102,630	$80,489	$3,660	$88,979
Median	Reference Nuclear	$93,500	$73,329	$3,334	$81,063
Minimum	Low Nuclear Production	$4,366	$3,424	$156	$3,780
Maximum	Reference Low Import	$443,678	$347,963	$15,821	$381,053

Table 18 (page 75) shows the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projections. Table 45 compares those total U_3O_8 production costs to the costs for maintaining 1 meter of water in the impoundments given in Table 44. As Table 45 shows, the cost to maintain 1 meter of water in the impoundments is much less than 1% of the total cost to produce U_3O_8 for all four cases analyzed.

Table 45: Comparison of Cost to Maintain 1 Meter of Water in the Impoundments to Total U_3O_8 Production Cost

Facility Type	2035 Projection Reference Nuclear Cost (million 2011$)		1 Meter Water Contribution
	Total Annual (Table 18)	1 Meter Water (Table 44)	
Conventional	$398	$0.103	0.026%
In-Situ Leach	$411	$0.080	0.019%
Heap Leach	$356	$0.004	0.001%
Mixed Facilities	$396	$0.089	0.022%

Total Annual Benefits from Maintaining 1 Meter of Water

By requiring a minimum of 1 meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)} \qquad (6\text{-}1)$$

Where:
- A = Radon attenuation factor (unitless)
- λ = Radon-222 decay constant (sec^{-1}) = 2.1×10^{-6} sec^{-1}
- D = Radon diffusion coefficient (cm^2/sec) = 0.003 cm^2/sec in water
- d = Depth of water (cm) = 100 cm

Solving the above equation shows that 1 meter of water has a radon attenuation factor of about 0.07. To demonstrate the impact that a 1-meter water cover would have, the doses and risks reported in Section 4.4, Table 13 (page 49), have been recalculated. In this recalculation, it was assumed that an additional 1 meter of water covered all of the radon sources. Table 46 shows the results of this recalculation, in terms of the dose and risk reduction attributable to covering the

source area with 1 meter of water. Table 46 shows both the original radon release (as reported in Table 13, page 49) and the radon release after the source area has been covered with 1 meter of water.

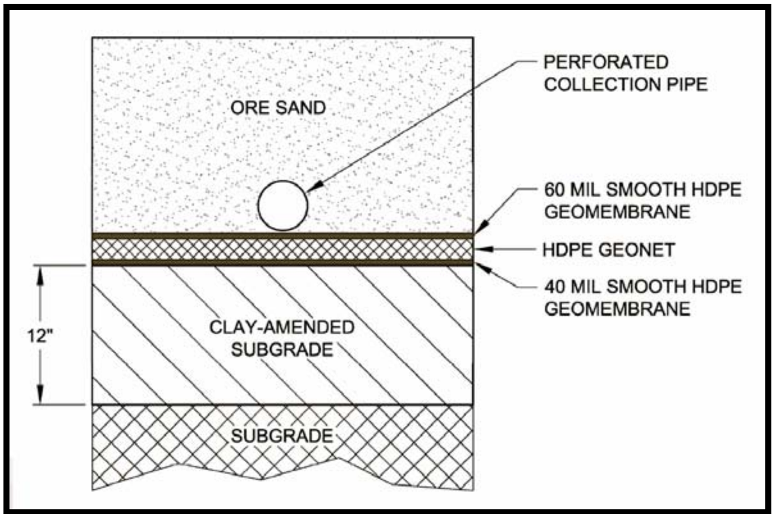
Table 46: Annual Dose and Risk Reduction from Maintaining 1 Meter of Water in the Impoundments

Uranium Site	Radon Release (Ci/yr)		Annual Dose Reduction		LCF[(a)] Risk Reduction (yr^{-1})	
	Table 13	1 Meter Water	Population (person-rem)	RMEI (mrem)	Population	RMEI
Sweetwater	2,075	147	0.5	1.1	2.7E-06	5.6E-07
White Mesa	1,750	124	4.8	11.1	3.2E-05	5.9E-06
Smith Ranch - Highlands	36,500	2,590	3.4	1.4	2.1E-05	7.2E-07
Crow Butte	8,885	630	2.5	3.1	1.6E-05	1.6E-06
Christensen/Irigaray	1,600	114	3.5	1.8	2.2E-05	9.2E-07
Alta Mesa	740	52	20.1	10.7	1.2E-04	5.7E-06
Kingsville Dome	6,958	494	53.9	10.5	3.5E-04	5.7E-06

* LCF = latent cancer fatalities

6.3.4 Liners for Heap Leach Piles

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap piles. Figure 26 shows a typical design of a heap leach pile double liner. Although Figure 26 shows a clay-amended layer beneath the double liner, for the reasons given in Section 6.3.2, this cost estimate has assumed that a GCL would be used beneath the double liner, as shown in Figure 24.



Source: Titan 2011

Figure 26: Typical Heap Pile Liner

Double Liner Unit Costs

The unit costs for installing a double liner, with a leakage collection system, to a heap leach pile are assumed to be the same as the units costs developed in Section 6.3.2 for nonconventional impoundments.

The base heap leach facility utilizes a conveyor to deliver crushed material to the pile (Titan 2011). However, if material is delivered to the pile by truck, then the truck would put additional stress on the liner. Additional costs would be incurred to protect the liner from the additional stress. Because this analysis uses a range of liner unit costs, the additional costs for protecting the liner if truck loading is employed have been enveloped.

Total Cost of Heap Leach Pile Double Liner

Section 6.2.2 base heap leach facility (i.e., Sheep Mountain in Wyoming) includes two 80-acre heap piles. Using the same method described for the nonconventional impoundment (page 96), it was estimated that 90.3 acres of material would be required for the upper liner and drainage (Geonet) layer, and 89.6 acres of material for the lower liner and GCL. With these quantities of material and the unit costs from Section 6.3.2, Table 47 presents the median, minimum, and maximum capital and installation costs for installing the double liner beneath the two 80-acre heap piles.

Table 47: Heap Pile Double Liner Capital and Installation Costs

Cost Type	Capital and Installation Cost
Mean	$25,200,000
Median	$20,600,000
Minimum	$11,900,000
Maximum	$60,700,000
Mean, w/o Upper Liner	$12,900,000

Table 47 includes capital and annual cost estimates for a Mean, w/o Upper Liner case. This case was added because even if not required to meet the requirements at 40 CFR 192.32(a)(1), the design of the heap leach pile would include at least a single liner to collect the lixiviant flowing out of the heap. The reason is that since the lixiviant flowing out of the heap contains the uranium, it is in the licensee's economic interest to recover as much of it as possible, and since the rinsing liquid would be mixed with the lixiviant, it too would be recovered. Thus, the Mean, w/o Upper Liner case estimates the cost to upgrade a single liner to a double liner system (i.e., the cost of the upper liner and the GCL have been removed).

To demonstrate the individual component contribution to the total capital and installation cost, Table 48 presents a breakdown by component of the calculated mean capital and installation cost.

Table 48: Mean Heap Pile Double Liner Capital Cost Breakdown

Liner Component	Unit Cost (ft^{-2})	Mean Heap Pile Double Liner Capital Cost
Upper Liner	$0.95	$3,730,077
Drainage (Geonet)	$0.64	$2,505,687
Lower Liner	$0.95	$3,702,230
GCL	$0.66	$2,579,315
Design & Engineering	20%	$2,503,462
Contractor Oversight	20%	$2,503,462
Overhead & Profit	20%	$3,504,847
Contingency	20%	$4,205,816
Total	—	$25,234,896

Table 49 presents the heap pile double liner annual cost estimates. The total annual cost is the sum of the annualized capital and installation cost and the annual O&M cost. The annualized capital cost was calculated by first dividing the capital cost of the double liner by the total amount of U_3O_8 expected to be produced during the lifetime of the heap leach facility, and then multiplying by the amount of U_3O_8 produced annually. The U_3O_8 annual production was based on 2035 projections made in Section 6.2.6.

Table 49 presents two cases. In the first case, it was assumed that all of the U_3O_8 required in 2035 would be produced by heap leach facilities, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 49: Heap Pile Double Liner Annual Costs

Case	Cost Type	Annualized Capital Cost	Annual O&M Cost	Total Annual Cost
Heap Only	Mean	$15,100,000	$220,000	$15,300,000
	Median	$12,300,000	$180,000	$12,500,000
	Minimum	$6,700,000	$60,000	$6,800,000
	Maximum	$51,100,000	$1,340,000	$52,400,000
	Mean, w/o Upper Liner	$7,700,000	$110,000	$7,800,000
Mix	Mean	$340,000	$5,000	$350,000
	Median	$280,000	$4,000	$280,000
	Minimum	$160,000	$1,000	$160,000
	Maximum	$1,600,000	$43,000	$1,600,000
	Mean, w/o Upper Liner	$170,000	$3,000	$170,000

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for installing a double liner under the heap leach pile is about 4% of the total cost of heap leach U_3O_8 production (i.e., $15.3 million/$356 million), while the cost to change from a single liner to a double liner is about 2% of the total cost of heap leach U_3O_8 production (i.e., $7.8 million/$356 million).

Finally, the Section 6.2.2 base heap leach facility design includes a double liner, with drainage layer (Geonet) collection system, as shown in Figure 26. Thus, there is no additional cost for the Section 6.2.2 base heap leach facility to meet the design and construction requirements at 40 CFR 192.32(a)(1).

Benefits from a Double-Lined Heap Leach Pile

Including a double liner in the design of all heap leach piles would reduce the potential for ground water contamination. Although the amount of the potential reduction is not quantifiable, it is important for decision makers to consider this benefit because of the significance of ground water as a source of drinking water.

6.3.5 Maintaining Heap Leach Piles at 30% Moisture

As described in Section 5.4, the goal of this GACT is to maintain 30% moisture content in the heap leach pile so that the radon flux will be no larger than the flux from dry ore.

Simply adding water to the surface of the heap leach pile will replenish and maintain the moisture content in the surface layer. The moisture content in the remainder of the heap leach

vertical profile will be a function of the ore materials ability to retain moisture. The field moisture capacity of any earthen material is a function of the grain size and the mineralogy of the materials. Accordingly, the 30% moisture content should be attained with all low grade ore materials, due to the presence of significant fine-grained materials. Furthermore, it may not be necessary to maintain the entire pile at 30% moisture content, but only the upper portion of the pile. The exact depth to which the 30% moisture content requirement would apply would be determined on a site by site basis. The cost to supply the water to replenish the pile's moisture content has been estimated below.

It is also recognized that imposing a 30% moisture content requirement on the pile might (and likely, would) require certain design changes to the pile. Principal concerns to be addressed during pile design are slope stability and the liquefaction potential. Regarding slope stability, many leach piles are provided with containment dikes which provide structural support to the pile. The 30% moisture content requirement will have little or no effect on the moisture associated with the containment dikes, and thus the dikes would continue to provide support. Additionally, the pile design may be altered to increase its stability. For example, lower slopes, higher confinement dikes, the construction of stair-step pad grade, or the installation of textured (as opposed to smooth) geomembrane liner in critical areas would enhance pile stability.

Regarding liquefaction potential, it has been estimated that liquefaction is unlikely if the degree of saturation in the pile is less than about 85% (Sassa 1985, as referred to in Smith 2002, Thiel and Smith 2004). Assuming a 2.7 ratio between moisture content and saturation (NRC 1984), the 30% moisture content require translates into 81% saturation, which is slightly below the level required for liquefaction. Needless to say, with the increase in the saturation that will result from the imposition of the 30% moisture content requirement, more attention will need to be paid to the pile design to minimize the liquefaction potential.

The costs associated with these design changes have not been included in the following cost estimate because any design change would depend very much on the site's characteristics, and in many cases the design change might be inexpensive to implement if it is identified during the design phase. For example, using a textured rather than smooth liner, constructing higher containment dikes, and using stair-step pad grade could all be incorporated into the pile's design at minimal, if any, additional cost.

Unit Water Cost

The unit costs for providing water to a heap leach pile are assumed to be the same as the unit costs developed in Section 6.3.3 (page 100) for providing water to nonconventional impoundments.

Cost of Soil Moisture Meters

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors (Irrometer 2010). The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft) (Ben Meadows 2012).

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair (Spectrum 2011, Spectrum 2012).

Total Annual Cost to Maintain 30% Moisture in the Heap Leach Pile

The only cost associated with maintaining the moisture level within the pile is the cost of the water. It is assumed that existing piping (used to supply lixiviant to the pile during leaching) would be used to supply water necessary for maintaining the moisture level. Also, it is assumed that the in-soil method for moisture monitoring would be used, and that the above costs are insignificant. Finally, it is assumed that moisture readings would be performed during the daily inspections of the heap pile (Visus 2009), with no additional workhours.

The base heap leach facility includes a heap pile that will occupy up to 80 acres at a height of up to 50 ft. With an assumed porosity of 0.39 (see Section 5.1.5, page 56) and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 50 presents the calculated cost for makeup water to maintain the moisture level in the heap pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates derived in Section 6.3.3 were used for this estimate.

Table 50: Heap Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of makeup water in perspective, during leaching and rinsing of the pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2) (Titan 2011), or about 4,220 in/yr. This application rate is almost two orders of magnitude larger than the mean net evaporation rate, and is over a factor of 40 larger than the maximum net evaporation rate, shown in Table 50, and should be sufficient to maintain the moisture content within the pile

Section 6.2.6 and Table 25 (page 89) present projections of the U_3O_8 production for the year 2035. Table 51 presents the annual cost for makeup water to maintain the heap pile's moisture content. Table 51 presents two cases. In the first case, Heap Only, it was assumed that heap leach facilities would produce all of the U_3O_8 required in 2035, while in the second case, it was assumed that heap leach facilities would be part of a mixture of uranium recovery facilities operating in 2035. For the second case, Table 25 gives the heap leach facility contribution to the total U_3O_8 required in 2035.

Table 51: Projected Annual Heap Pile Makeup Water Cost

Cost Type	Projected 2035 U_3O_8 Production	Makeup Water Cost ($/yr)	
		Heap Only	Mix
Mean	Reference Nuclear	$15,000	$300
Median	Reference Nuclear	$14,000	$300
Minimum	Low Nuclear Production	$650	$20
Maximum	Reference Low Import	$66,000	$2,100

Table 18 (page 75) shows that the total estimated cost to produce all of the U_3O_8 projected for 2035 by the Reference Nuclear projection is $356 million. Thus, the cost for maintaining 30% moisture in the heap leach pile is well under 1% of the total cost of heap leach U_3O_8 production (i.e., $15,000/$356,000,000).

Total Annual Benefits from Maintaining 30% Moisture in the Heap Leach Pile

By requiring a minimum 30% by weight moisture content in the heap leach pile, the release of radon from these piles would be reduced by up to about a factor of 2½, as shown in Figure 15. From the base case production profile (BRS 2011, page 86), it can be determined that the heap pile ore has a mean U-238 concentration of 213 pCi/g, and a range of 135 to 321 pCi/g. Assuming the normalized radon flux from a heap pile with 30% moisture content is 1 pCi/(m^2-sec) per pCi/g Ra-226, and that the Ra-226 is in equilibrium with the U-238, then the mean annual radon release from the 80-acre heap pile would be 2,180 Ci/yr. A comparable annual radon release from a dryer heap pile could be as high as 5,450 Ci/yr. Table 52 shows a comparison of annual doses and risks using these heap pile annual radon releases and the release to dose/risk relationship for the Western Generic site from Table 13.

Table 52: Annual Dose and Risk Comparison for Maintaining 30% Moisture Content in the Heap Pile

Heap Pile Moisture Content (by Weight)	Radon Release (Ci/yr)	Annual Dose		LCF[(a)] Risk (yr^{-1})	
		Population (person-rem)	RMEI (mrem)	Population	RMEI
>30%	2,180	6.3	7.5	3.4E-04	9.6E-06
<30%	5,450	16	19	8.4E-04	2.4E-05

* LCF = latent cancer fatalities

Of course the exact reduction will depend upon the specific heap pile. For example, if a heap pile is operating at 20% moisture content without the GACT, then according to Figure 15, imposing the GACT would result in a radon flux reduction of about a factor of 1.6. Also, as Figure 14 shows, the response of the radon emanation coefficient to increasing moisture is very dependent on the material. This relationship between the emanation coefficient, moisture content, and material also influences the amount of reduction provided by the GACT.

6.3.6 Summary of Proposed GACT Standards Economic Assessment

Sections 6.3.2 through 6.3.5 presents the details of the economic assessment that was performed for implementing each of the four proposed GACT standards. **Table 53** presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, **Table 53** presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of **Table 53**.

Table 53: Proposed GACT Standards Costs per Pound of U_3O_8

	Unit Cost (\$/lb U_3O_8)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	\$0.013	\$0.010	\$0.0010
GACT – Liners for Heap Leach Piles	—	—	\$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	\$0.0043
GACTs – Total for All Four	\$1.05	\$3.08	\$2.24
Baseline Facility Costs (Section 6.2)	\$51.56	\$52.49	\$46.08

Based on the **Table 53**, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

Included in the Section 6.2 descriptions is the operational duration and amount of uranium produced by each reference facility. This information from Section 6.2 has been used to calculate an annual U_3O_8 production rate for each type facility, which in turn has been coupled with the unit costs provided in **Table 53**, to generate the annual cost for implementing each GACT at each reference facility. These annual costs are presented in **Table 54**. Again for comparison the baseline cost (without the GACTs) is provided at the bottom of **Table 54** for each type facility.

Table 54: Proposed GACT Standards Reference Facility Annual Costs

	Reference Facility Annual Cost ($/yr)		
	Conventional	**ISL**	**Heap Leach**
GACT – Double Liners for Nonconventional Impoundments	$410,000	$2,900,000	$230,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$5,300	$9,700	$1,100
GACT – Liners for Heap Leach Piles	—	—	$2,100,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4,500
GACTs – Total for All Four	$420,000	$2,900,000	$2,300,000
Baseline Facility Costs	$21,000,000	$49,000,000	$48,000,000

Based on EIA (EIA 2011a) nuclear power productions, Section 6.2.6 estimated the U.S. U_3O_8 productions until the year 2035. Using those EIA-based production estimates for 2011 and 2035 and the unit cost values from **Table 53**, **Table 55** presents the estimated national annual cost for implementing the proposed GACTs.

Table 55: Proposed GACT Standards National Annual Costs

	National Annual Cost ($1,000/yr)			
	2011 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,500	$12,000	$0	$15,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$45	$40	$0	$85
GACT – Liners for Heap Leach Piles	—	—	$0	$0
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$0	$0
GACTs – Total for All Four	$3,600	$12,000	$0	$15,000
Baseline Facility Costs	$180,000	$200,000	$0	$380,000
	2035 U_3O_8 Production			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$3,300	$11,000	$230	$14,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$42	$37	$1.1	$80
GACT – Liners for Heap Leach Piles	—	—	$2,100	$2,100
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$4.5	$4.5
GACTs – Total for All Four	$3,300	$11,000	$2,300	$17,000
Baseline Facility Costs	$160,000	$190,000	$48,000	$400,000

Since no facilities were operating, it was assumed that all 2011 U_3O_8 production was divided between conventional and ISL facilities with the 2009 ratio, as shown in Table 25 (i.e., 47.3% conventional and 52.7% ISL). As described in Section 6.2.6, for 2035 it was assumed that one

heap leach facility would be operational, and that the remainder of the U_3O_8 production would be divided between conventional and ISL facilities with the 2009 ratio.

Of course, if the amount of U_3O_8 produced by each type facility changes the annual cost to implement the GACTs changes as well. For example if in 2035 all U_3O_8 is produced by ISL facilities, then the national annual cost to implement the GACTs would increase from $17 million (as shown in **Table 55**) to $24 million. Alternatively, if all 2035 U_3O_8 is produced by conventional facilities, then the national annual cost to implement the GACTs would decrease to $8.1 million. Because the baseline U_3O_8 production costs are fairly constant across all three types of uranium recovery facilities (see **Table 53** and Sections 6.2.1 through 6.2.4), the 2035 baseline U_3O_8 production national annual cost would remain fairly constant around $400 million, regardless of how the U_3O_8 is produced.

Table 56 presents the national cost for the implementation of the four proposed GACTs summed over the years 2011 to 2035. As with the **Table 55** annual national costs, the **Table 56** summed national costs are based on EIA (EIA 2011a) nuclear power productions, as described in Section 6.2.6.

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Non-Discounted			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$81,000	$270,000	$5,800	$350,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$1,000	$910	$27	$2,000
GACT – Liners for Heap Leach Piles	—	—	$52,000	$52,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$110	$110
GACTs – Total for All Four	$82,000	$270,000	$58,000	$410,000
Baseline Facility Costs	$4,000,000	$4,600,000	$1,200,000	$9,800,000
	Discounted @3%			
	Conventional	**ISL**	**Heap Leach**	**Total**
GACT – Double Liners for Nonconventional Impoundments	$58,000	$190,000	$4,100	$250,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$740	$650	$19	$1,400
GACT – Liners for Heap Leach Piles	—	—	$37,000	$37,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$80	$80
GACTs – Total for All Four	$59,000	$190,000	$41,000	$290,000
Baseline Facility Costs	$2,900,000	$3,300,000	$850,000	$7,000,000

Table 56: Proposed GACT Standards Summed National Costs

	National Cost, Summed from 2011 to 2035 ($1,000)			
	Discounted @ 7%			
	Conventional	ISL	Heap Leach	Total
GACT – Double Liners for Nonconventional Impoundments	$40,000	$130,000	$2,900	$170,000
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$510	$450	$13	$970
GACT – Liners for Heap Leach Piles	—	—	$26,000	$26,000
GACT – Maintaining Heap Leach Piles at 30% Moisture	—	—	$55	$55
GACTs – Total for All Four	$41,000	$130,000	$29,000	$200,000
Baseline Facility Costs	$2,000,000	$2,300,000	$590,000	$4,800,000

As with the **Table 55** annual national costs, if the amount of U_3O_8 assumed to be produced by each type facility changes the **Table 56** summed national costs to implement the GACTs changes as well. For example if all U_3O_8 is produced by ISL facilities, then the non-discounted summed national cost to implement the GACTs would increase from $410 million (as shown in **Table 56**) to $590 million. Alternatively, if all U_3O_8 is produced by conventional facilities, then the non-discounted summed national cost to implement the GACTs would decrease to $200 million. Similar to the baseline annual national costs, the baseline U_3O_8 production non-discounted summed national cost would remain around $9.8 billion, regardless of how the U_3O_8 is produced.

6.4 Environmental Justice

Concerning environmental justice, EPA's economic assessment guidelines state:

> *Distributional analyses address the impact of a regulation on various subpopulations. Minority, low-income and tribal populations may be of particular concern and are typically addressed in an environmental justice (EJ) analysis. Children and other groups may also be of concern and warrant special attention in a regulatory impact analysis.* [EPA 2010, Section 10]

6.4.1 Racial Profile for Uranium Recovery Facility Areas

This section presents information on the racial (e.g., tribal populations) and economic (e.g., low income) profiles of the areas surrounding existing and proposed uranium recovery facilities.

Table 57 presents the racial profiles in the immediate areas (i.e., counties) surrounding the existing and proposed uranium recovery facilities, while Table 58 presents the profiles in the surrounding regional area (i.e., states) and on a national basis. A comparison of Table 57 to Table 58 indicates whether the racial population profile surrounding the uranium recovery facilities conform to the national and/or regional norms.

Table 57: Racial Profile for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	White	Black	Native American	Others
Juan Tafoya	Conventional	McKinley, NM	22.2%	0.4%	75.4%	2.0%
White Mesa Mill	Conventional	San Juan, UT	42.7%	0.1%	55.8%	1.3%
Grants Ridge	Heap Leach	Cibola, NM	56.2%	1.0%	40.9%	1.8%
Sheep Mountain	Heap Leach	Fremont, WY	78.3%	0.1%	19.8%	1.8%
Crow Butte	In-Situ Leach	Dawes, NE	94.5%	0.9%	3.0%	1.6%
Piñon Ridge	Conventional	Montrose, CO	96.6%	0.4%	1.4%	1.7%
Sweetwater Mill	Conventional	Sweetwater, WY	96.3%	0.8%	1.1%	1.9%
Christensen / Irigaray	In-Situ Leach	Campbell, WY	97.4%	0.2%	1.0%	1.4%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	97.5%	0.1%	1.0%	1.4%
Shootaring Canyon	Conventional	Garfield, CO	97.2%	0.5%	0.8%	1.6%
Kingsville Dome	In-Situ Leach	Kleberg, TX	92.8%	3.9%	0.8%	2.6%
Goliad	In-Situ Leach	Goliad, TX	93.6%	5.0%	0.7%	0.7%
Palangana	In-Situ Leach	Duval, TX	98.3%	0.6%	0.7%	0.4%
Alta Mesa	In-Situ Leach	Brooks, TX	98.8%	0.4%	0.6%	0.3%

Source: http://www.census.gov/popest/counties/asrh/

Table 58: Regional and National Racial Profiles

State		White	Black	Native American	Others
New Mexico	NM	85.4%	2.1%	9.8%	2.7%
Wyoming	WY	95.1%	0.8%	2.3%	1.8%
Utah	UT	94.0%	0.9%	1.4%	3.7%
Colorado	CO	90.7%	4.0%	1.2%	4.1%
Nebraska	NE	92.7%	4.1%	0.9%	2.3%
Texas	TX	83.7%	11.8%	0.7%	3.9%
United States	US	81.1%	12.7%	0.9%	5.3%

Source: http://www.census.gov/popest/counties/asrh/

At 10 of the 15 sites, the percentage of Native Americans in the population exceeds the national norm, while at nine sites, the percentage of Native Americans in the population exceeds the regional norm. At 11 of the 15 sites, the percentage of the population that is White exceeds both the national and regional norms. Finally, the percentage of the population at all uranium recovery sites that is either Black or Other is less than the national norm, while the percentage of Blacks and Others is less than the regional norm at all but one site.

For all of the sites considered together, the data in Table 57 do not reveal a disproportionately high incidence of minority populations being located near uranium recovery facilities. However, certain individual sites may be located in areas with high minority populations. Those sites would need to be evaluated during their individual licensing processes.

6.4.2 Socioeconomic Data for Uranium Recovery Facility Areas

Table 59 shows the socioeconomic data for the immediate areas (i.e., counties) surrounding the existing and planned uranium recovery facilities. Specifically, the socioeconomic data shown in Table 59 is the fraction of land that is farmed, the value of that farmland, and the nonfarm per capita wealth. The percentages shown next to the value of that farmland and the nonfarm per capita wealth indicate where the site ranks when compared to all other counties in the United States.

Table 59: Socioeconomic Data for Uranium Recovery Facility Counties

Existing/Proposed Facility	Facility Type	County, State	Farm Land	Farm Value Per Hectare		Per Capita Nonfarm Wealth	
White Mesa Mill	Conventional	San Juan, UT	31.1%	$670	4.0%	$103,073	0.6%
Juan Tafoya	Conventional	McKinley, NM	90.9%	$185	0.0%	$115,603	1.9%
Alta Mesa	In-Situ Leach	Brooks, TX	72.8%	$1,423	13.2%	$117,693	2.2%
Grants Ridge	Heap Leach	Cibola, NM	58.2%	$378	0.7%	$118,862	2.4%
Palangana	In-Situ Leach	Duval, TX	74.1%	$1,792	17.5%	$132,493	6.9%
Crow Butte	In-Situ Leach	Dawes, NE	88.0%	$895	6.9%	$144,291	15.1%
Kingsville Dome	In-Situ Leach	Kleberg, TX	0.0%	$1,478	13.9%	$149,865	20.4%
Goliad	In-Situ Leach	Goliad, TX	92.6%	$2,244	22.0%	$162,584	35.4%
Piñon Ridge	Conventional	Montrose, CO	23.3%	$2,916	30.1%	$181,133	59.5%
Sheep Mountain	Heap Leach	Fremont, WY	42.6%	$768	5.3%	$186,775	65.4%
Shootaring Canyon	Conventional	Garfield, CO	21.4%	$3,195	34.3%	$200,316	76.7%
Smith Ranch - Highland	In-Situ Leach	Converse, WY	92.5%	$381	0.7%	$208,583	82.1%
Christensen/Irigaray	In-Situ Leach	Campbell, WY	97.3%	$437	1.1%	$225,858	89.3%
Sweetwater Mill	Conventional	Sweetwater, WY	22.2%	$242	0.1%	$232,504	91.2%

The discussion first focuses on the per capita nonfarm wealth. For comparison, the per capita nonfarm wealth in the United States ranges from $39,475 (Slope County, North Dakota) to $618,954 (New York County, New York). Table 59 shows that uranium recovery facilities are located in areas that are very poor (i.e., ranked in the lowest 0.6% in the country) to areas that are very well to do (i.e., ranked in the 91.2 percentile). Six of the 15 sites are located in areas that have per capita nonfarm wealth that is above the 50th percentile in the United States. On the other hand, five sites are located in areas in which the per capita nonfarm wealth is below the country's 10th percentile.

Table 59 shows that eight of the sites have more than 50% of their land devoted to farming. However, the Table 59 farm value data show that the farmland for all 15 sites is below the 35th percentile farmland value in the United States. This could indicate that the farmland is of poor quality, or simply that the land is located in an economically depressed area. For comparison, farmland in the United States ranges in value from $185 per hectare (McKinley County, New Mexico, which is the location of the proposed Juan Tafoya uranium recovery facility) to $244,521 per hectare (Richmond County, New York).

For all of the sites combined, the data provided in Table 59 do not reveal a disproportionately high incidence of low-income populations being located near uranium recovery facilities. However, certain individual sites may be located within areas of low-income population. Those sites would need to be evaluated during their individual licensing processes.

6.5 Regulatory Flexibility Act

The Regulatory Flexibility Act requires federal departments and agencies to evaluate if and/or how their regulations impact small business entities. Specifically, the agency must determine if a regulation is expected to have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

If a rulemaking is determined to have a significant economic impact on a substantial number of small entities, then the agency must conduct a formal regulatory flexibility analysis. However, if the agency determines that a rulemaking does not have a significant economic impact on a substantial number of small entities, then it makes a certification of that finding and presents the analyses that it made to arrive at that conclusion.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with 40 CFR 192.32(a)(1) (see Section 5.4). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the agency is proposing to eliminate the distinction made in the 1989 rule between impoundments constructed pre-1989 and post-1989, since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored annually to demonstrate that the average Rn-222 flux does not exceed 20 pCi/(m^2-sec).

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are the White Mesa mill and the proposed Piñon Ridge mill owned by Energy Fuels; the Shootaring Canyon mill owned by Uranium One, Inc.; and the Sweetwater mill owned by Kennecott Uranium Co. . Of the three companies that own conventional mills, one, Energy Fuels, is classified as a small business, on the basis that they have fewer than 500 employees (EF 2012 states that Energy Fuels has 255 active employees in the U.S.).

Energy Fuels' White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full, it will be contoured and covered. Then, a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings.

Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Section 5.4 describes the proposed GACTs. Because both the White Mesa mill and the proposed Piñon Ridge mill are in compliance with the proposed GACT, it can be concluded that the rulemaking will not impose any new economic impacts on small business (i.e., Energy Fuels). For White Mesa, the proposed rule will actually result in a cost saving as Energy Fuels will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in 40 CFR 192.32(a)(1) and that a minimum depth of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to ISL facilities and heap leach facilities. Currently, there are six operating ISLs (as shown in Table 8) and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco; Alta Mesa owned by Mestena Uranium, LLC; Willow Creek owned by Uranium One, Inc.; and Hobson and La Palangana owned by Uranium Energy Corp. Again, using the criterion of fewer than 500 employees, Mestena Uranium, LLC, and Uranium Energy Corp. are small businesses, while both Cameco and Uranium One, Inc., which is owned by Rosatom, are large businesses.

All of the evaporation ponds at the four conventional mills and the six ISLs were built in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

In addition to the operating ISLs listed above, Table 9 shows that there are nine ISLs have been proposed for licensing. These are: Dewey Burdock owned by Powertech Uranium Corp.; Nichols Ranch owned by Uranerz Energy Corp.; 'Jab and Antelope' and Moore Ranch owned by Uranium One Americas, Inc., a subsidiary of Rosatom; Church Rock and Crownpoint owned by Hydro Resources, Inc. a subsidiary of Uranium Resources, Inc.; Ross owned by Strata Energy Inc., a subsidiary of Australian-based Peninsula Energy Limited; Goliad owned by Uranium Energy Corp.; and Lost Creek owned by Lost Creek ISR, LLC a subsidiary of Ur-Energy. All of these companies, except Rosatom, are small businesses.

According to the licensing documents submitted by the owners of the proposed ISLs, all will be constructed in conformance with 40 CFR 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and while in standby status.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. Considering that the current (i.e., January 30, 2012) price

of U_3O_8 is $52 per pound (UxC 2012), this cost does not pose a significant impact to any of these small entities.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30-percent moisture content by weight during operations. Although no heap leach facilities are currently licensed, the small business Energy Fuels is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that has been presented (Titan 2011), the Energy Fuels facility will have an evaporation pond, a collection pond, and a raffinate pond. All three ponds will be double lined with leak detection. Based on the unit and facility cost comparisons presented in **Table 53** and **Table 54**, respectively, the implementation of the proposed GACTs at a heap leach facility (such as Sheep Mountain) would increase the U_3O_8 production cost by about 5%. Based on this small increase, the Sheep Mountain Project would: 1) remain competitive with U_3O_8 production cost for other types of facilities, and 2) continue to provide Energy Fuels with a profit. Energy Fuels is the only entity known to be preparing to submit a license application for a heap leach facility.

Of the 20 uranium recovery facilities identified above, 13 are owned by small businesses. As documented above in this report, those 13 facilities are either already in compliance with the proposed GACTs, with no additional impact, or compliance with the GACTs would not pose a significant impact to any of the small businesses (e.g., \$52.03 lb^{-1} versus \$52 lb^{-1}). Thus, after considering the economic impacts of this proposed rule on small entities, it is concluded that this action will not have a significant economic impact on a substantial number of small entities.

7.0 REFERENCES

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From: Rosnick, Reid
Sent: Monday, April 21, 2014 9:55 AM
To: Miller, Beth
Cc: Herrenbruck, Glenna
Subject: Subpart W

Beth,

Attached is the proposed rule and the signature page. Is it possible to pdf the rule and merge the signature page into it?

For the websites:

On epa.gov/radiation, at the Subpart W webpage link, I think we should add something like "On April 17, 2014 Administrator McCarthy signed the proposed rule for the Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings. To view the signed copy click here. The proposed rule will be published soon in the Federal Register. Please check back for date(s)/time(s) of possible public hearings."

I think we should post the same language on the Subpart W website. What do you think?

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

National Emission Standards for Radon Emissions From Operating Mill Tailings

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

APR 17 2014

Dated:

Gina McCarthy,
Administrator.

ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other

information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

G. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks
H. Executive Order 13211: Actions Concerning Regulations
That Significantly Affect Energy Supply, Distribution or Use
I. National Technology Transfer Advancement Act
J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990

CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be

available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment

of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and

(d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to

major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]” 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term “uranium recovery facilities” and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or

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[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines “source material” as “(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.” (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, “byproduct material” means the “tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.” (10 CFR 20.1003 and 40.4)

tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and

[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology

[5] http://www.epa.gov/radon/risk_assessment.html.

produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is

processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as "acid" or "alkaline" systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.
[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

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[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

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[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or

covered.[12]” Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to “new” impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989,

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[12] See 54 FR 51689.

unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the

tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40

acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent

subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

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[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 $pCi/m^2/sec$. The radon flux for the entire tailings impoundment was calculated to be 6.01 $pCi/m^2/sec$. The calculated radon flux

from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture

associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at

[17] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19]

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[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area

limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40

acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill

Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized “generic” sites, one located in the eastern half of the United States and one

located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for "Clean Air Act Assessment Package-1988 version 3.0," is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

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[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery

[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities.

[26] See 54 FR 51656

Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous

disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and

are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40,

Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This

liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap

leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is

difficult to determine whether there is any contribution above background radon values. EPA has stated in the ***Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document*** (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions

from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no

more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be

available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are

also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-

effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous

one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-

keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in

inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for Proposed Recordkeeping Requirements (Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*

Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required

to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the

requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the

phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable

approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is

about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional

impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original

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[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A	=	Radon attenuation factor (unit less)
λ	=	Radon-222 decay constant (sec^{-1})
	=	2.1×10^{-6} sec^{-1}
D	=	Radon diffusion coefficient (cm^2/sec)
	=	0.003 cm^2/sec in water
d	=	Depth of water (cm)
	=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

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[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as "process water" from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain

one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the

ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to

be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%,

the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term "operational life" of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to "rest," which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until

the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three

potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be

performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution

applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap

leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of

uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a

pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In

these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section

264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. <u>Applicability of 40 CFR 192.32(a) to Subpart W</u>

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency

administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule’s air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis

report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate

(without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two

proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total

annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost

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[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these

requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would

require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule

would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the

impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made

concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium

recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is

independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between

impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses,

while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these

three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on

small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the

potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a “significant energy action” as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (“NTTAA”), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB,

explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40

CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

From: Rosnick, Reid
Sent: Wednesday, April 16, 2014 7:43 AM
To: Miller, Beth
Cc: Herrenbruck, Glenna
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Hi Beth,

We're getting close to signature on the Subpart W rule. Is the process for getting the docket live a lengthy one?

Reid

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
Regulatory Management Division
Office of Policy
US Environmental Protection Agency
1200 Pennsylvania Ave NW (1806A)
Washington, DC 20460
(202) 564-2855
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ENVIRONMENTAL PROTECTION AGENCY **6560-50-P**

40 CFR Part 61

[EPA-HQ-OAR-2008-0218; FRL-9816-2]

RIN 2060-AP26

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before **[**INSERT DATE 90 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER**]**.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA-HQ-OAR-2008-0218, by one of the following methods:

- www.regulations.gov: Follow the on-line instructions for submitting comments.
- Email: a-and-r-docket@epa.gov
- Fax: 202-566-9744
- Mail: Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave., NW, Washington, DC 20460.
- Hand Delivery: EPA West Building, Room 3334, 1301 Constitution Ave., NW Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA-HQ-OAR-2008-0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at www.regulations.gov, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other

information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through www.regulations.gov or e-mail. The www.regulations.gov website is an "anonymous access" system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an e-mail comment directly to EPA without going through www.regulations.gov your e-mail address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD-ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm.

Docket: All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or

other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air and Radiation Docket is (202) 566-1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave., NW Washington, DC 20460; telephone number: 202-343-9290; fax number: 202-343-2304; email address: rosnick.reid@epa.gov.

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this Action Apply to Me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code[1]	Examples of regulated Entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit

authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. ***Submitting CBI.*** Do not submit this information to EPA through www.regulations.gov or e-mail. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. ***Tips for Preparing Your Comments.*** When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, Federal Register date and page number).
- Follow directions - The agency may ask you to respond to specific questions or organize

comments by referencing a Code of Federal Regulations (CFR) part or section number.

- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA – Atomic Energy Act
ALARA – As low as reasonably achievable
BID – Background information document
CAA – Clean Air Act
CAAA – Clean Air Act Amendments of 1990

CCAT – Colorado Citizens Against Toxic Waste
CFR – Code of Federal Regulations
Ci – Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE – U.S. Department of Energy
EIA – economic impact analysis
EO – Executive Order
EPA – U.S. Environmental Protection Agency
FR – Federal Register
GACT – Generally Available Control Technology
gpm - Gallons Per Minute
HAP – Hazardous Air Pollutant
ICRP – International Commission on Radiological Protection
ISL – In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF – Latent Cancer Fatality – Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS – National Ambient Air Quality Standards
NCRP – National Council on Radiation Protection and Measurements
mrem – millirem, 1×10^{-3} rem
MACT – Maximum Achievable Control Technology
NESHAP – National Emission Standard for Hazardous Air Pollutants
NRC – U.S. Nuclear Regulatory Commission
OMB – Office of Management and Budget
pCi – picocurie, 1×10^{-12} curie
Ra-226 - Radium-226
Rn-222 – Radon-222
Radon flux - A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second ($pCi/m^2/sec$).
RCRA – Resource Conservation and Recovery Act
Subpart W – National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250-61.256
TEDE – Total Effective Dose Equivalent
UMTRCA – Uranium Mill Tailings Radiation Control Act of 1978
U.S.C. – United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be

available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: http://www.epa.gov/ttn/oarpg/. The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER], we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) "in effect before the date of enactment

of the Clean Air Act Amendments of 1990 [Nov. 15, 1990]. . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].” EPA promulgated 40 CFR part 61, Subpart W, “National Emission Standards for Radon Emissions From Operating Mill Tailings,” (“Subpart W”) on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as "radon"). We presently have no data or information that shows any other HAPs being emitted from

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA-HQ-OAR-2008-0218-0013) for EPA’s alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA-HQ-OAR-2008-0218-0019).

these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA-HQ-OAR-2008-0218-0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources "which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants." Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and

(d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101-228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to

major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is "facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings." 40 CFR 61.250. Subpart W defines "uranium byproduct material or tailings" as "the waste produced by the extraction or concentration of

[2] None of the sources in this source category are major sources.

uranium from any ore processed primarily for its source material content.[3]" 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term "uranium recovery facilities" and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or

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[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines "source material" as "(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium." (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, "byproduct material" means the "tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes." (10 CFR 20.1003 and 40.4)

tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills.

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called "yellowcake" because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or "tailings") which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and

[4] The term "yellowcake" is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

concentration processes and are then deposited in an impoundment or "mill tailings pile" which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer. [5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology

[5] http://www.epa.gov/radon/risk_assessment.html.

produces a better return on the investment dollar (EPA-HQ-OAR-2008-0218-0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is

processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as "acid" or "alkaline" systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.
[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years. Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or "heap," on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32 (a).

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[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is "rested," meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

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[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.
H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for "existing" impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: "This rule will have the practical effect of requiring the mill owners to keep their piles wet or

covered.[12]" Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to "new" impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989,

[12] See 54 FR 51689.

unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.
2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the

tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings (absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 $pCi/m^2/s$ per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (Note: The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40

acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> "EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption."

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent

subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{-7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner

likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K – Surface Impoundments.

Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

[14] Section 114(a) letters and responses can be found at http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 $pCi/m^2/sec$. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a).

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the

[15] "Standby" is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term "impoundment," we are using the term as described by industry.

cell to fill it to the specified final elevation. It is expected to close in the near future (EPA-HQ-OAR-2008-0218-0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux

from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA-HQ-OAR-2008-0218-0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture

associated with occasional precipitation events; consequently, there are no beaches[17]. The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989-Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at

[17] The term "beaches" refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) the Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19]

[18] Source: U.S. Energy Information Administration, http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20-30 license applications over the next 5-10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

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[20] Source: http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

[21] http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.

5. Flux Requirement versus Management Practices for Conventional Impoundments in operation before December 15, 1989.

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: 1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? 2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA-HQ-2008-0218-0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area

limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40

acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA-HQ-2008-0218-0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill

Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States[22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in

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[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated Risk Assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized "generic" sites, one located in the eastern half of the United States and one

located in the southwest United States. (These two model sites do not exist. They are idealized using representative features of mills in differing climate and geography). This information has been collected into one document[23] that has been placed in the docket (EPA-HQ-OAR-2008-0218-0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for “Clean Air Act Assessment Package-1988 version 3.0,” is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of

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[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon

which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery

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[24] http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.
[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 $pCi/m^2/sec$. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4})[26]. The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities.

[26] See 54 FR 51656

Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA-HQ-OAR-0218-0087.

uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner requirements must be met under Subpart W.[28]

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional impoundments.

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous

disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and

are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40,

Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This

liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-conventional impoundments where tailings are contained in ponds and covered by liquids.

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap

leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is

difficult to determine whether there is any contribution above background radon values. EPA has stated in the ***Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document*** (August, 1986):

> "Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions."

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions

from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA-HQ-OAR-2008-0218-0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles.

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no

more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be

available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined "dewatered" tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are

also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are

proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-

effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. <u>What are the notification, recordkeeping and reporting requirements?</u>

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous

one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA-HQ-OAR-2008-0218-0088).

comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-

keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in

inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

Table 1: Burden Hours and Costs for Proposed Recordkeeping Requirements (Annual figures except where noted)

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	20*	$1,360*

Verifying the one meter liquid requirement for nonconventional impoundments	288	$12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	$86,548

*These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the Federal Register. To our knowledge, there is no existing operating uranium recovery facility that would be required

to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the Federal Register or upon startup of the facility, whichever is later.

IV. Rationale for this Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA-HQ-OAR-0218-0066). We also held discussions with trade association and industry representatives and other stakeholders at various public

meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or

[30] See http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

B. Proposed GACT standards for operating mill tailings.

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA-HQ-OAR-2008-0218-0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the

requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA-HQ-OAR-2008-0218-0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA-HQ-OAR-2008-0218-0087):

Table 2: Estimated Liner Costs

Table 2: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	\$0.013	\$0.010	\$0.0010
GACT – Liners for Heap Leach Piles	–	–	\$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	\$0.0043
GACTs – Total for All Four	\$1.05	\$3.08	\$2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) a conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the

phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable

approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA-HQ-OAR-2008-0218-0087), the costs for constructing this type of liner system per facility is

about 4% of the total baseline capital costs of a heap leach pile facility (EPA-HQ-OAR-2008-0218-0087).[31]

2. Conventional Impoundments.

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that all conventional impoundments – both existing impoundments and new impoundments - comply with one of the two work practice standards, phased disposal or continuous

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed "do nothing" or "business as usual" scenarios.

disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520-1-86-009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional

impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-conventional Impoundments where Tailings are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters[32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original

[32] http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.

Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:			
	A	=	Radon attenuation factor (unit less)
	λ	=	Radon-222 decay constant (sec^{-1})
		=	2.1×10^{-6} sec^{-1}
	D	=	Radon diffusion coefficient (cm^2/sec)
		=	0.003 cm^2/sec in water
	d	=	Depth of water (cm)
		=	100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see "Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,"(EPA-HQ-OAR-2008-0218-0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment’s operator.

The most obvious source of water is what is known as “process water” from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain

one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA-HQ-OAR-2008-0218-0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA-HQ-OAR-2008-0218-0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the

ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to

be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%,

the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term “operational life” of the facility. We are aware of several operations that take place during the uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to “rest,” which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until

the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no "process water" component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three

potential sources of impoundment make-up water were considered: (1) municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be

performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

Table 3: Heap Leach Pile Annual Makeup Water Cost

Cost Type	Water Cost ($/gal)	Net Evaporation (in/yr)	Makeup Water Cost ($/yr)	Makeup Water Rate (gpm/ft^2)
Mean	$0.00010	45.7	$4,331	2.3E-05
Median	$0.00010	41.3	$3,946	2.1E-05
Minimum	$0.000035	6.1	$196	3.0E-06
Maximum	$0.00015	96.5	$13,318	4.8E-05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution

applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap

leach pile. While not directly correlative, the process of heap leach could be defined as active "milling." The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

- Clarification of the term “standby” and how it relates to the operational phase of an impoundment;
- Amending the definition of “operation” of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;
- Determining whether Subpart W adequately addresses protection from extreme weather events;
- Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and
- Removing the phrase “as determined by the Nuclear Regulatory Commission” in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term “Standby”

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in “standby” mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the “closure period” as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of

uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment.

Today we are proposing to add a definition to 40 CFR 61.251 to define "standby" as:

> Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the definition of "Operation" for a conventional impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that "operation" means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a

pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not "new tailings." The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of "operation" in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In

these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section

264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on; malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for ground-water detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase "…as determined by the Nuclear Regulatory Commission" from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency

administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis

report that is included in the public docket for this proposed rule (EPA-HQ-OAR-2008-0218-0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate

(without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

Table 4: Proposed GACT Standards Costs per Pound of U_3O_8			
	Unit Cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT – Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT – Maintaining 1 Meter of Water in Nonconventional Impoundments	$0.013	$0.010	$0.0010
GACT – Liners for Heap Leach Piles	–	–	$2.01
GACT – Maintaining Heap Leach Piles at 30% Moisture	–	–	$0.0043
GACTs – Total for All Four	$1.05	$3.08	$2.24
Baseline Facility Costs (Section 6.2)	$51.56	$52.49	$46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two

proposed new facilities: (1) the Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total

annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction[35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these

requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would

require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule

would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the

impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action." The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may "raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order." Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

- Establish and maintain records
- Make reports, install, use, and maintain monitoring equipment or method
- Sample emissions in accordance with EPA-prescribed locations, intervals and methods
- Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made

concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium

recovery facility, due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA-HQ-OAR-2008-0218. Submit any comments related to the ICR to EPA and OMB. See ADDRESSES section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after **[Insert date of publication in the Federal Register.]**, a comment to OMB is best assured of having its full effect if OMB receives it by **[Insert date**

30 days after publication in the Federal Register.]. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is

independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between

impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 pCi/m^2/sec.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees’ criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses,

while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these

three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on

small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and

operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5-501 of the Order has the

potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law No. 104-113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB,

explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

____
Dated:

____
Gina McCarthy,
Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—-[National Emission Standards for Hazardous Air Pollutants]

1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

2. Section 61.251 is amended by revising definition e and adding new definitions h-m as follows:

§61.251 Definitions

*   *   *   *   *

(e) Operation. Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

(h) Conventional Impoundment. A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) Non-Conventional Impoundment. A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) Heap Leach Pile. A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) Standby. Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) Uranium Recovery Facility. A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) Heap Leach Pile Operational Life. The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

3. Section 61.252 is revised to read as follows:

§61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) Phased disposal in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) Continuous disposal of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) Non-Conventional Impoundments. Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) Heap Leach Piles. Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§61.253 [Removed]

4. Section 61.253 is removed.

§61.254 [Removed]

5. Section 61.254 is removed.

6. Section 61.255 is revised to read as follows:

§61.255 Recordkeeping requirements

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40

CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

From: Rosnick, Reid
Sent: Wednesday, April 16, 2014 7:41 AM
To: Nesky, Anthony
Cc: Herrenbruck, Glenna
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Hi Tony,

We are getting close to signature on the Subpart W rule. We'll need to get started on the hearing process.

Reid

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

Caryn Muellerleile
Regulatory Management Division
Office of Policy
US Environmental Protection Agency
1200 Pennsylvania Ave NW (1806A)
Washington, DC 20460
(202) 564-2855
muellerleile.caryn@epa.gov

From: Perrin, Alan
Sent: Wednesday, April 16, 2014 6:41 AM
To: Flynn, Mike
Cc: Edwards, Jonathan
Subject: Fw: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

FYI

From: Rosnick, Reid
Sent: Tuesday, April 15, 2014 7:26:45 PM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Good News!

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:58 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

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From: Rosnick, Reid
Sent: Tuesday, April 15, 2014 7:27 PM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: FW: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

Good News!

From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:58 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

OP has approved OAR's **NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings** for Administrator's signature. This tier 2 notice of proposed rulemaking cleared EO 12866 review on January 13, 2014. The signature package is in OEX.

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From: Muellerleile, Caryn
Sent: Tuesday, April 15, 2014 5:59 PM
To: Barron, Alex; Nickerson, William; Owens, Nicole; Balserak, Paul; Elman, Barry; Pritchard, Eileen
Cc: Lee, Raymond; Rosnick, Reid; Schultheisz, Daniel; Morgan, Ruthw; Mcquilkin, Wendy; Eagles, Tom; Farrar, Wanda; Hambrick, Amy
Subject: APPROVED for SIGNATURE - NESHAP Subpart W: Standards for Radon Emissions From Operating Uranium Mill Tailings (5281)

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From: Rosnick, Reid
Sent: Wednesday, April 09, 2014 10:46 AM
To: Peake, Tom
Cc: Perrin, Alan; Edwards, Jonathan
Subject: Ute Mt. Ute Consultation Letter

In anticipation of the FR notice of the Subpart W proposal I drafted a letter to the Chairman of the Ute Mt. Ute requesting consultation. I used a template from the Tribal Handbook, but any comments you have would be appreciated. I assume that once the proposal is published we will have a short window to get this out. Thanks.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Manuel Heart, Chairman
Ute Mountain Ute Tribe
P.O. Box 6
Towaoc, CO 81334

Dear Chairman Heart:

On ***DATE*** the U.S. Environmental Protection Agency (EPA) proposed revisions to the Radon Emission Standards for Operating Uranium Mill Tailings rule, also known as Subpart W. The purpose of this letter is to invite you to consult.

The EPA is proposing several revisions:

- Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - Conventional tailings impoundments.
    - Evaporation ponds or other nonconventional impoundments at uranium recovery facilities.
    - Heap leach piles.
- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT) or management practices. This standard requires double liners and leak detection systems.
- Remove the requirement for monitoring radon, but limit the amount of byproduct material that can be exposed.
    - For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal.
    - For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile.
    - For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond.
- Add definitions for when a uranium recovery facility is in operation or standby.
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements.

The EPA will accept comment for 90 days after the proposed rule is published in the Federal Register on or about ***DATE***. If you wish to initiate government to government consultations with the EPA on this rule, please contact __________------. Please contact us by______in order to request consultation.

We request your input to assure that we develop the best rule possible. We endeavor to conduct our efforts with sensitivity to the needs and culture of your tribe and with attention to the potential impact of our actions. We look forward to hearing from you.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

cc: Tribal Environmental Director
Tribal Environmental Staff

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:05 PM
To: Thornton, Marisa
Subject: FW: 40 CFR Part 61, Subpart W public comment deadline extension request
Attachments: Subpart W extension request letter.docx

From: Pete Dronkers [mailto:pdronkers@earthworksaction.org]
Sent: Tuesday, June 24, 2014 11:55 AM
To: Rosnick, Reid; Nesky, Anthony
Subject: 40 CFR Part 61, Subpart W public comment deadline extension request

Dear Mr. Rosnick and Nesky,

Please find attached a letter signed by a dozen groups nationwide in support of EPA extending the public comment period for the proposed rulemaking affecting Subpart W, by 120 days.

I would appreciate your confirmation that you have received this letter.

Thank you very much,

--Pete Dronkers

=== EARTHWORKS: Protecting Communities and the Environment

Pete Dronkers
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pdronkers@earthworksaction.org
twitter: earthworksrocks
facebook/earthworksaction

USE YOUR CONSUMER POWER: SIGN THE PLEDGE TO END DIRTY GOLD MINING!
http://pledge.nodirtygold.org

Combined Federal Campaign #41290, Member of EarthShare

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:00 PM
To: Thornton, Marisa
Subject: FW: Docket Items

From: Miller, Beth
Sent: Monday, June 30, 2014 7:18 AM
To: Rosnick, Reid
Subject: RE: Docket Items

Hi Reid,

I will get those put in sometime today. Hope you are feeling well.

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Monday, June 30, 2014 6:59 AM
To: Miller, Beth
Subject: Docket Items

Hi Beth,

Here are a couple of presentations and some meeting notes for the Subpart W docket:

1) Presentation to the NRC/NMA Uranium Recovery Conference, June 2014
2) Presentation to the National Tribal Air Association, June 2014
3) Meeting notes between EPA and the Ute Mountain Ute Tribe, june 2014

Thanks!

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:00 PM
To: Thornton, Marisa
Subject: FW: Docket Items

From: Miller, Beth
Sent: Monday, June 30, 2014 7:45 AM
To: Rosnick, Reid
Subject: RE: Docket Items

Done

Success!

You have created a new document with the following attributes

Docket ID: EPA-HQ-OAR-2008-0218

Document ID: EPA-HQ-OAR-2008-0218-DRAFT-0111

Title: Memo to: Docket EPA-HQ-OAR-2008-0218
Document Type: SUPPORTING & RELATED MATERIALS
Status: Metadata_Ready

Current Assignee: Akram, Assem (EPA)

Success!

You have created a new document with the following attributes:

Docket ID: EPA-HQ-OAR-2008-0218

Document ID: EPA-HQ-OAR-2008-0218-DRAFT-0112

Title: U.S. EPA Regulations Review Update: Subpart W NESHAPS (40 CFR 61)
Document Type: SUPPORTING & RELATED MATERIALS
Status: Metadata_Ready

Current Assignee: Akram, Assem (EPA)

Success!

You have created a new document with the following attrib

Docket ID: EPA-HQ-OAR-2008-0218

Document ID: EPA-HQ-OAR-2008-0218-DRAFT-0110

Title: U.S. EPA Regulations Review Update
Document Type: SUPPORTING & RELATED MATERIALS
Status: Metadata_Ready

Current Assignee: Akram, Assem (EPA)

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Monday, June 30, 2014 6:59 AM
To: Miller, Beth
Subject: Docket Items

Hi Beth,

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1) Presentation to the NRC/NMA Uranium Recovery Conference, June 2014
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3) Meeting notes between EPA and the Ute Mountain Ute Tribe, june 2014

Thanks!

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563

rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:00 PM
To: Thornton, Marisa
Subject: FW: EO 13175 and EJ Issues

From: Childers, Pat
Sent: Monday, June 30, 2014 7:47 AM
To: Rosnick, Reid
Cc: Peake, Tom; Gogal, Danny; Baca, Andrew
Subject: RE: EO 13175 and EJ Issues

Reid

Danny Gogal and Andrew Baca are my go to folks on these issues in general. I am including them on the email.

Pat

From: Rosnick, Reid
Sent: Monday, June 30, 2014 7:44 AM
To: Childers, Pat
Cc: Peake, Tom
Subject: EO 13175 and EJ Issues

Hi Pat,

I got the impression that the UMUT will want someone at the consultation to discuss EO 13175 and EJ issues. Can you help me with some names? Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:00 PM
To: Thornton, Marisa
Subject: FW: CMS New Assignment - Michele Painter - AX-14-001-1586

-----Original Message-----
From: cmsadmin@epa.gov [mailto:cmsadmin@epa.gov]
Sent: Monday, June 30, 2014 9:18 AM
To: Miller, Beth; Perrin, Alan; Gillam, Connie; Ferguson, Rafaela
Subject: CMS New Assignment - Michele Painter - AX-14-001-1586

Control AX-14-001-1586 has been assigned to your office on 6/30/14 9:17 AM by Michele Painter. Please go to the CMS webpage to view the details of the control.

Summary Information -
Control Number: AX-14-001-1586
Control Subject: DRF - Daily Reading File -Request for Extension of the Public Comment Period for the Subpart W National Emissions Standards for Radon Emissions Rulemaking
From: Heart, Manuel

Note: This Email was automatically generated. Please do not attempt to respond to it. You can access this control at https://cms.epa.gov/cms. Questions or comments concerning CMS should be directed to CMS Support at 202-564-4985 or CMS Information@epa.gov.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:00 PM
To: Thornton, Marisa
Subject: FW: References for which we need scans

From: Nesky, Anthony
Sent: Monday, June 30, 2014 12:13 PM
To: Rosnick, Reid
Subject: References for which we need scans

Dear Reid:

Here are the non-copyrighted references for which we needs copies to scan and post on the web.

- FR (Federal Register) 1977. EPA established environmental protection standards for nuclear power operations pursuant to its authority under the Atomic Energy Act (AEA), Volume 42, p. 2858,January 13, 1977.
- FR (Federal Register) 1979. EPA determination that radionuclides constitute a hazardous air pollutant within the meaning of section 112(a)(1), Volume 44, p. 78738, December 27, 1979.
- FR (Federal Register) 1984. EPA withdrew the proposed NESHAPs for Elemental Phosphorus Plants, DOE-Facilities, and NRC-Licensed Facilities. Volume 49, p. 43906. October 23, 1984.
- FR (Federal Register) 1985a. EPA promulgated final standards for Elemental Phosphorus Plants, DOE-Facilities, and NRC-Licensed Facilities, Volume 50, p. 7280, February 8, 1985.
- FR (Federal Register) 1985b. EPA established a work practice standard for Underground Uranium Mines, Volume 50, p. 15385, April 17, 1985.
- FR (Federal Register) 1986. 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants, Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings; Final Rule, Volume 51, p. 34056, September 24, 1986.
- FR (Federal Register) 1989a. National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides; Proposed Rule and Notice of Public Hearing, Volume 54, pp. 9612–9668, March 7, 1989.
- FR (Federal Register) 1989b. National Emission Standards for Hazardous Air Pollutants; Radionuclides, Volume 54, p. 51654, December 15, 1989.
- FR (Federal Register) 1994. National Emission Standards for Hazardous Air Pollutants; Final Rule, Volume 59, p. 36280, July 15, 1994.
- SC&A (S. Cohen and Associates) 2011. “Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings, Task 4 – Detailed Risk Estimates,” Contract Number EP-D-10-042, Work Assignment No. 1-04, Task 4, SC&A, Inc., Vienna, Virginia, March 25, 2011.
- VDEQ (Virginia Department of Environmental Quality) 2000. “Landfill Cost Estimate Form.”

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 3:59 PM
To: Thornton, Marisa
Subject: FW: Please draft a new page for the Subpart W site

From: Nesky, Anthony
Sent: Monday, June 30, 2014 12:36 PM
To: Romero, Carmen
Cc: Thornton, Marisa
Subject: RE: Please draft a new page for the Subpart W site

Dear Carmen:

Thanks for turning this around so quickly. We are scanning some references and will have to add them. In the meantime, here are some changes to the page:

A. Here are the links that aren't working:

1) Jackson, A., 2009. "EPA's Fuzzy Bright Line Approach to Residual Risk," Ecology Law Quarterly, Vol. 35:439, 2009.
http://www.boalt.org/elq/documents/elq36-2-00-infelise-2009-0620.pdf

2) SRK Consulting 2010a. "Powertech Uranium Corp., NI 43-101 Preliminary Assessment, Dewey-Burdock Project, Custer and Fall River Counties, South Dakota," July 6, 2010.
http://www.powertechuranium.com/i/pdf/DB_PEA_SRK_RPT_20100706.pdf

B. Please make the first bullet the second line of the title, so that it is like this:

EIA References

References from "Background Information Document Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking" (138 pp, 2.24 MB) About PDF

C. Thanks for your suggestion about breaking the references up into categories, but unfortunately, we have to present them as they appeared in EIA document.

D. Please add spaces between the bullets to make the page easier to read.

E. Please add the disclaimer to all non-government links.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Romero, Carmen
Sent: Friday, June 27, 2014 10:50 AM

To: Nesky, Anthony
Cc: Rosnick, Reid; Thornton, Marisa; Herrenbruck, Glenna
Subject: RE: Please draft a new page for the Subpart W site

Hi Tony,

Here is the draft page with the information you provided.
http://epastage.epa.gov/staging1/rpd/neshaps/subpartw/eiareferences.html
The references page is a long page. It will probably be easier to view this page by adding categories to the long list of bullets.

FYI – Beth is no longer doing web work. Attached is the file with all the Radiation pages divided between Marisa and Carmen. Please send any web requests to both of us at all times and we will take care of it accordingly.

From: Nesky, Anthony
Sent: Thursday, June 26, 2014 12:16 PM
To: Romero, Carmen
Cc: Rosnick, Reid; Thornton, Marisa; Herrenbruck, Glenna
Subject: Please draft a new page for the Subpart W site

Dear Carmen:

We now need a reference page on the Subpart W website. Please draft a page to be called:

http://www.epa.gov/radiation/neshaps/subpartw/eiareferences.html

The page content is attached in a Word file. Some entries are highlighted because we don't have links for them yet—please ignore the highlighting and add them to the web page. Please post to the test server so that everyone can review it before publishing it to the web server.

Thanks for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 3:59 PM
To: Thornton, Marisa
Subject: FW: Additions to Subpart W Website

From: Thornton, Marisa
Sent: Tuesday, July 01, 2014 7:36 AM
To: Rosnick, Reid
Subject: RE: Additions to Subpart W Website

Done - http://epastage.epa.gov/staging1/rpd/neshaps/subpartw/rulemaking-activity.html

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From: Rosnick, Reid
Sent: Monday, June 30, 2014 6:45 AM
To: Thornton, Marisa
Subject: Additions to Subpart W Website

Hi Marisa,

I have a couple of presentations for you to add to the website. Please add them directly under the link to the OMB meeting. The new language is in red, and the presentations are attached. Thanks!

Reid

Presentations

- NRC/NMA Uranium Recovery Workshop (12 pp, 256 K), May 2011
- National Mining Association 2008 (15 pp, 345 K), April 2008
- Canon City Colorado (20 pp, 236 K), June 2009
- National Mining Association 2009 (17 pp, 179 K), July 2009
- Rapid City South Dakota (22 pp, 128 K), October 2009
- National Mining Association (11 pp, 88 K), October 2009
- National Mining Association 2010 (16 pp, 163K) May 2010
- National Webinar (26 pp, 226 K), June 2010
- Tuba City Arizona Uranium Stakeholders (14 pp, 313 K) September 2010
- NRC's Uranium Recovery Licensing Workshop (24 pp, 2.72 MB) January 2011
- Sheep Mountain Uranium Project (82 pp, 12.46 MB) April 7, 2011
- Link to National Mining Association presentations.
- National Mining Association presentation "Experimental Determination of Radon Fluxes over Water" (22 pp, 516 K) May 2012
- This is a link to the Office of Management and Budget (OMB) website which documents a listening meeting between members of the National Mining Association and several federal organizations regarding Subpart W.
- NRC/NMA Uranium Recovery Workshop, June 2014

- Presentation to National Tribal Air Association, June 2014

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 3:59 PM
To:	Thornton, Marisa
Subject:	FW: Please draft a new page for the Subpart W site

From: Thornton, Marisa
Sent: Tuesday, July 01, 2014 1:03 PM
To: Nesky, Anthony
Cc: Romero, Carmen
Subject: RE: Please draft a new page for the Subpart W site

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2) SRK Consulting 2010a. "Powertech Uranium Corp., NI 43-101 Preliminary Assessment, Dewey-Burdock Project, Custer and Fall River Counties, South Dakota," July 6, 2010.
http://www.powertechuranium.com/i/pdf/DB_PEA_SRK_RPT_20100706.pdf

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Tel: 202-343-9597
nesky.tony@epa.gov

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Thanks for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:01 PM
To: Thornton, Marisa
Subject: FW: Docket Items
Attachments: NMA 2014 4 30 14.pptx; NTAA Rosnick.pptx; Summary of 6_25_14 meeting with Ute Mt Ute to discuss consultation.docx

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From: Rosnick, Reid
Sent: Monday, June 30, 2014 6:59 AM
To: Miller, Beth
Subject: Docket Items

Hi Beth,

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Thanks!

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

U.S. EPA Regulations Review Update:
Subpart W NESHAPS (40 CFR 61)

Reid J. Rosnick

Radiation Protection Division

U.S. Environmental Protection Agency

National Tribal Air Association
NTAA-EPA Air Policy Call
June 26th, 2014

Review of 40 CFR 61 Subpart W

- National Emission Standard for Hazardous Air Pollutants (NESHAP) for radon emissions for operating mill tailings
- Review began after receiving Notice of Intent to Sue (NOI) by two Colorado environmental groups
  - Based on EPA's alleged failure to review & revise regulation within ten years after enactment of Clean Air Act Amendments of 1990 (11/15/2000)
  - Plaintiffs filed suit against EPA
  - Settlement agreement reached November 2009

Existing Subpart W Summary

- Applies to radon emissions from operating uranium mill tailings
  - Radon emissions flux standard: 20 pCi/m^2/sec
- After 12/15/1989, new impoundments were required to meet one of two new work practices:
  - ✓ Phased disposal – Impoundment size(2) $\leq$ 40 acres
  - ✓ Continuous disposal – dewatered tailings with no more than 10 acres uncovered
  - ✓ Both must meet design, construction, ground-water monitoring standards at 40 CFR 192.32(a)
- Work practices were designed to achieve at least equivalent risk reductions as obtained by the numerical standard

Existing Subpart W, continued

- Regulation originally written with emphasis on conventional impoundments
- In Situ Leach/Recovery (ISL/ISR) extraction has become more commonplace since original promulgation
  - ✓ Does not generate significant tailings
  - ✓ Wastes containing uranium byproduct material are placed in evaporation ponds/impoundments
- ISL/ISR, conventional mill, heap leach operations expected

Proposed Subpart W Revisions

- EPA is proposing several revisions (under authority of the Clean Air Act Amendments of 1990):
  - ✓ Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities
    - heap leach piles

Proposed Subpart W Revisions, cont.

- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT), or management practices
  - ✓ Management practices incorporate existing “work practices” for conventional impoundments
  - ✓ Management practices also specified for evaporation ponds and heap leach piles
  - ✓ This standard requires double liners and leak detection systems per 40 CFR 192.32(a)

Proposed Subpart W Revisions, cont.

- Proposed GACT removes the requirement for monitoring radon, but still limits the amount of byproduct material that can be exposed
  - ✓ For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal
  - ✓ For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile
  - ✓ For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond

Proposed Subpart W Revisions, cont.

- Add definitions for:
  - ✓ uranium recovery facility
  - ✓ operation and standby
  - ✓ Conventional impoundment
  - ✓ non-conventional impoundment
  - ✓ heap leach pile
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements

Outreach

- Presentations made in Gallup, NM, Rapid City, SD, Denver, CO, Ute Mountain Ute Recreation Center (White Mesa)
- Dedicated website: (www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html
- Quarterly stakeholder conference calls (July 3, 866-299-3188, code 2023439563#)
- Letters requesting consultation sent to 55 tribes
- Consultation requested by Ute Mountain Ute

Comments/Public Hearing

- The proposed rule was published in the *Federal Register* on May 2, 2014 (79 FR 25388)
- EPA will accept comment until July 31, 2014 (90 days after the proposed rule was published)
- EPA has received requests to extend comment period. Extension will be granted - time has not been decided
- Public hearing will be held during the comment period

U.S. EPA Regulations Review Update:
Subpart W NESHAPS (40 CFR 61)
Uranium and Thorium Mill Tailings (40 CFR Part 192)

Andrea Cherepy, Phil Egidi, Reid Rosnick

Radiation Protection Division

U.S. Environmental Protection Agency

NRC/NMA Uranium Recovery Workshop

June 18-19, 2014

Review of 40 CFR 61 Subpart W

- National Emission Standard for Hazardous Air Pollutants (NESHAP) for radon emissions for operating mill tailings
- Review began after receiving Notice of Intent to Sue (NOI) by two Colorado environmental groups
  - ✓ Based on EPA's alleged failure to review & revise regulation within ten years after enactment of Clean Air Act Amendments of 1990 (11/15/2000)
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Existing Subpart W, continued

- Regulation originally written with emphasis on conventional impoundments
- In Situ Leach/Recovery (ISL/ISR) extraction has become more commonplace since original promulgation
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Proposed Subpart W Revisions, cont.

- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT), or management practices
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  - ✓ Management practices also specified for evaporation ponds and heap leach piles
  - ✓ This standard requires double liners and leak detection systems per 40 CFR 192.32(a)

Proposed Subpart W Revisions, cont.

- Proposed GACT removes the requirement for monitoring radon, but still limits the amount of byproduct material that can be exposed
  - ✓ For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal
  - ✓ For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile
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Proposed Subpart W Revisions, cont.

- Add definitions for:
  - ✓ uranium recovery facility
  - ✓ operation and standby
  - ✓ Conventional impoundment
  - ✓ non-conventional impoundment
  - ✓ heap leach pile
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements

Comments/Public Hearing

- The proposed rule was published in the *Federal Register* on May 2, 2014 (79 FR 25388)
- EPA will accept comment until July 31, 2014 (90 days after the proposed rule was published)
- A public hearing will be held during the comment period

40 CFR 192 - Status

- EPA plans to revise its regulations for uranium and thorium milling
- Regulatory changes will focus on groundwater protection, restoration and stability at ISR sites
- Revisions are currently undergoing interagency review
- Anticipate *Federal Register* publication this fall with public hearings soon thereafter

40 CFR 192 - Background

- Issued under authority of Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978
- Establishes standards protective of public health, safety and the environment for active and closed mill sites
- Addresses residual radioactive material at Title I (inactive) sites and byproduct material at Title II (active) sites
- Issued in 1983; last revised in 1995

40 CFR 192 – Taking Into Account ISR

- ISR now dominant form of uranium extraction in the US
- ISR directly alters groundwater chemistry
- Current standards lack explicit provisions for ISR operations
- NRC and Agreement States use license conditions to protect public health, safety and the environment
- *We plan to propose an additional subpart focused on uranium in-situ recovery*

40 CFR 192 – Primary Objectives for Rule Revisions

- Ensure that background groundwater conditions are adequately characterized
  - ✓ ... with enough detail to provide the data necessary to help determine when groundwater restoration has occurred
- Align groundwater standards in the revised rule with current regulatory criteria
- Ensure that groundwater is stable and likely to stay that way
  - ✓ ...by providing detailed requirements regarding restoration metrics and post-restoration monitoring

40 CFR 192 – Next Steps

- Proposal submitted to OMB for Executive Order 12866 review in late April
- We expect the proposal will be published in the *Federal Register* this fall
- Comments will be accepted for 90 days after publication date

Memo to: Docket EPA-HQ-OAR-2008-0218

Subject: 6-25-14 meeting with Ute Mountain Ute Tribe to discuss preparations for the July 10, 2014 consultation between EPA and the Tribe on EPA's current proposed regulation at 40 CFR 61

From: Reid J Rosnick, Radiation Protection Division

Members of EPA: Reid Rosnick, Tom Peake, Pat Childers, Jed Harrison, Angelique Diaz, Scott Patefield, Scott Jackson, Art Palomares

Ute Mt. Ute Tribe representatives: Scott Clow, Celine Hawkins, Colin Larrick, Mike Keller, Tomoe Natori

Scott Clow noted that the consultation is scheduled for July 10, 2014 beginning at approximately 9 am, MDT. He will arrange for a conference call-in line. EPA noted that members of Region 8 will attend while members of ORIA will call in. The consultation will be about the proposed Subpart W rulemaking, but may dovetail into other areas the Tribe has discussed. For instance, if any time remains, we could discuss the off-site or alternate feed issues. It was noted that Region 8, the Tribe and the state of Utah will be holding a meeting in a month or so to discuss issuers related to enforcement and the off-site rule.

EPA, Scott and Celine discussed the questions/answers to be discussed during the consultation:

The meeting was then adjourned.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:01 PM
To: Thornton, Marisa
Subject: FW: Please draft a new page for the Subpart W site
Attachments: webpage-owners.docx

From: Romero, Carmen
Sent: Friday, June 27, 2014 10:50 AM
To: Nesky, Anthony
Cc: Rosnick, Reid; Thornton, Marisa; Herrenbruck, Glenna
Subject: RE: Please draft a new page for the Subpart W site

Hi Tony,

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Thanks for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Radiation Website - Updated 6/24/14

	FOLDERS	# FILES	COMMUNICATIONS	SUBJECT MATTER EXPERT	WEBMASTER
1.	Assessment	29	Tony	Puskin/ Boyd	Carmen
2.	Basic	12	Jess	Boyd	Carmen
3.	Cleanup	11	Tony	Schultiesz	Carmen
4.	Federal	7	Angela	Boyd	Carmen
5.	Glossary	12			Marisa
6.	Heast	6	Jess	Boyd	Carmen
7.	JW-RM	10	Dennis	Hellberg	Carmen
8.	Larw	9	Tony	Schultiesz	Carmen
9.	Laws	11	Tony	Schultiesz	Carmen
10.	Marlap	15	Tony	Snead/Griggs contact page	Marisa
11.	Marssim	87	Tony	Snead	Marisa
12.	Mixed Waste	198	Tony	Schultiesz	Carmen
13.	NCRFO	1			Carmen
14.	Neshaps	66	Tony	Rosnick	Marisa
15.	News (wipp-news)	1	Ray	Lee	Marisa
16.	Protect	2	Jess	DeCair	Carmen
17.	Radionuclides	14	Angela	Boyd	Carmen
18.	RadMap	1	Dennis	Hellberg	Carmen
19.	RadNet	105	Tony	Dan Askren/ Petko	Marisa
20.	Rert	39	Jess		Marisa
21.	Source Reduction	20	Tony	Nawar	Carmen
22.	Sources	16	Tony	Nawar	Carmen
23.	Tenorm	29	Tony	Egidi	Carmen
24.	Understand	30	Angela?	Boyd	Carmen
25.	Wipp	17	Ray	Walsh	Marisa
26.	Yucca	10	Ray	Schultiesz	Carmen
27.	Japan Website	archived	N/A	N/A	Marisa
28.	RadTown Website		Glenna	Boyd/Schultiesz	Marisa

	FILES	COMMUNICATIONS	SUBJECT MATTER EXPERT	WEBMASTER
1.	Air-water-overview.html	Tony	Various	Carmen
2.	All.html	Page to be dropped	Various	Carmen
3.	Atozindex.html	Marisa	N/A	Carmen
4.	Basic-information-overview.html	Marisa	N/A	Carmen
5.	Cleanup.html	Tony	Schultiesz	Carmen
6.	Contact.html	Angela	N/A	Carmen
7.	Disclaim.html	Obsolete?	Obsolete?	Carmen
8.	Emcp-overview.html	Tony	N/A	Carmen
9.	Emergencies.html	Jess	DeCair	Marisa
10.	Emergency-response-overview.html	Jess	DeCair	Marisa
11.	Error404.html	Marisa	Thornton	Carmen
12.	General-information-overview.html	Tony	N/A	Carmen
13.	How_to_order.html	Marisa	Sanders	Carmen
14.	Index.html	Tony	N/A	Carmen
15.	Keyradcontacts.html	Marisa	N/A	Carmen
16.	Labs.html	Tony	Lowell	Carmen

Radiation Website - Updated 6/24/14

	FILES	COMMUNICATIONS	SUBJECT MATTER EXPERT	WEBMASTER
17.	Librarians.html	Page to be dropped	N/A	Carmen
18.	Links.html	Tony	N/A	Carmen
19.	Manage.html	Tony	Schultiesz	Carmen
20.	Natural-radiation-overivew.html	Tony	N/A	Carmen
21.	People.html	Page to be dropped	Page to be dropped	Carmen
22.	Programs.html	Tony	N/A	Carmen
23.	Pubs.html	Tony	Sanders	Carmen
24.	Rafg-overview.html	Tony	Puskin	Carmen
25.	Reference.html	Tony	N/A	Carmen
26.	Ref.-information-oveview.html	Page to be dropped	Page to be dropped	Carmen
27.	Regions.html	Tony	N/A	Carmen
28.	Reporters.html	Page to be dropped	N/A	Carmen
29.	Sitemap.html	Marisa	Thornton	Carmen
30.	Students.html	Tony	N/A	Carmen
31.	Student-teacher-pubs.html	Tony	N/A Obsolete?	Carmen
32.	Techreg.html	Tony	N/A Obsolete?	Carmen
33.	Thank-you.html	Obsolete	Obsolete	Carmen
34.	Topics.html	Tony	N/A Obsolete?	Carmen
35.	Training.html	Tony	Snead	Carmen
36.	Trythis.html	Delete	Delete	Carmen
37.	Understanding-rad-overview.html	Tony	Boyd	Carmen
38.	Waste-management-overview.html	Tony	Schultiesz	Carmen

	NAME	# FILES	COMMUNICATIONS	SUBJECT MATTER EXPERT	WEBMASTER
1.	Docs	1,463	Various	Various	Marisa/ Carmen
2.	Feed.xml	1	Marisa	Thornton	Marisa
3.	Glossary	12	Tony	Various	Marisa
4.	.htaccess	1	Marisa	Thornton	Carmen
5.	Images	288	Carmen	Various	Carmen
6.	Library	229	Various	Various	Carmen
7.	Mailto	2	Angela	N/A	Marisa
8.	Podcasts & Videos	599	Carmen	Various	Carmen
9.	S	1	To be merged with Styles	?	Marisa/ Carmen
10.	Scripts	3	Marisa	Thornton	Marisa
11.	Spry-Assets	2	Marisa	Thornton	Marisa
12.	SSF-RM	5	Carmen	Hellberg	Marisa
13.	Styles	3	Marisa	Thornton	Marisa
14.	Sw_passwords	1	Marisa	Thornton	Marisa
15.	Templates	38	Marisa	Thornton	Marisa
16.	Testing Folder	5	Marisa	Thornton	Marisa
17.	Videos	13	Carmen	Romero	Carmen

This file is located on G: CRIO > Web > Web Team > **webpage-owners.docx**

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:01 PM
To:	Thornton, Marisa
Subject:	FW: NESHAP Subpart W
Attachments:	NTAA Rosnick.pptx

From: Rosnick, Reid
Sent: Friday, June 27, 2014 6:19 AM
To: Niebling, William
Cc: Edwards, Jonathan; Perrin, Alan; Peake, Tom
Subject: NESHAP Subpart W

William,

Jon Edwards asked me to send you some information on NESHAP Subpart W. As luck would have it, I just gave a generalized briefing to the National Tribal Air Association. It will give you a brief update on the proposed rule, as well as the outreach we have performed over the past four years. Please feel free to contact me if you have further questions or comments.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

U.S. EPA Regulations Review Update:
Subpart W NESHAPS (40 CFR 61)

Reid J. Rosnick

Radiation Protection Division

U.S. Environmental Protection Agency

National Tribal Air Association
NTAA-EPA Air Policy Call
June 26th, 2014

Review of 40 CFR 61 Subpart W

- National Emission Standard for Hazardous Air Pollutants (NESHAP) for radon emissions for operating mill tailings
- Review began after receiving Notice of Intent to Sue (NOI) by two Colorado environmental groups
  - Based on EPA's alleged failure to review & revise regulation within ten years after enactment of Clean Air Act Amendments of 1990 (11/15/2000)
  - Plaintiffs filed suit against EPA
  - Settlement agreement reached November 2009

Existing Subpart W Summary

- Applies to radon emissions from operating uranium mill tailings
  - Radon emissions flux standard: 20 pCi/m^2/sec
- After 12/15/1989, new impoundments were required to meet one of two new work practices:
  - ✓ Phased disposal – Impoundment size(2) ≤ 40 acres
  - ✓ Continuous disposal – dewatered tailings with no more than 10 acres uncovered
  - ✓ Both must meet design, construction, ground-water monitoring standards at 40 CFR 192.32(a)
- Work practices were designed to achieve at least equivalent risk reductions as obtained by the numerical standard

Existing Subpart W, continued

- Regulation originally written with emphasis on conventional impoundments
- In Situ Leach/Recovery (ISL/ISR) extraction has become more commonplace since original promulgation
  - ✓ Does not generate significant tailings
  - ✓ Wastes containing uranium byproduct material are placed in evaporation ponds/impoundments
- ISL/ISR, conventional mill, heap leach operations expected

Proposed Subpart W Revisions

- EPA is proposing several revisions (under authority of the Clean Air Act Amendments of 1990):
  - ✓ Clearly stating that the standards apply to all units that contain uranium byproduct material. These units include, but are not limited to:
    - conventional tailings impoundments
    - evaporation ponds or other nonconventional impoundments at uranium recovery facilities
    - heap leach piles

Proposed Subpart W Revisions, cont.

- Propose that all uranium recovery facilities comply with Generally Available Control Technology (GACT), or management practices
  - ✓ Management practices incorporate existing “work practices” for conventional impoundments
  - ✓ Management practices also specified for evaporation ponds and heap leach piles
  - ✓ This standard requires double liners and leak detection systems per 40 CFR 192.32(a)

Proposed Subpart W Revisions, cont.

- Proposed GACT removes the requirement for monitoring radon, but still limits the amount of byproduct material that can be exposed
  - ✓ For conventional impoundments, limit tailings exposure using either phased disposal or continuous disposal
  - ✓ For heap leach piles, limit tailings exposure using phased disposal and maintain a 30 % moisture content in the pile
  - ✓ For evaporation ponds, require at least one meter of liquid be constantly maintained in the pond

Proposed Subpart W Revisions, cont.

- Add definitions for:
  - ✓ uranium recovery facility
  - ✓ operation and standby
  - ✓ Conventional impoundment
  - ✓ non-conventional impoundment
  - ✓ heap leach pile
- Require the owner/operator of a uranium recovery facility to maintain records that confirm that impoundments have been constructed according to the requirements

Outreach

- Presentations made in Gallup, NM, Rapid City, SD, Denver, CO, Ute Mountain Ute Recreation Center (White Mesa)
- Dedicated website: (www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html
- Quarterly stakeholder conference calls (July 3, 866-299-3188, code 2023439563#)
- Letters requesting consultation sent to 55 tribes
- Consultation requested by Ute Mountain Ute

Comments/Public Hearing

- The proposed rule was published in the *Federal Register* on May 2, 2014 (79 FR 25388)
- EPA will accept comment until July 31, 2014 (90 days after the proposed rule was published)
- EPA has received requests to extend comment period. Extension will be granted - time has not been decided
- Public hearing will be held during the comment period

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:02 PM
To: Thornton, Marisa
Subject: FW: Question on copyrighted materials and rulemaking

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From: Lee, Raymond
Sent: Thursday, June 26, 2014 3:12 PM
To: Nesky, Anthony
Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: RE: Question on copyrighted materials and rulemaking

Hi Tony,

As mentioned in the docket section of these FR templates, there are certain restrictions when dealing with copyrighted material, CBI or any other material restricted by statute:

"All documents in the docket are listed in the www.regulations.gov index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy."

So for those stakeholders that want access to copyrighted material, they will have to request hard copies individually.

Thanks,

Ray

Sent by EPA Wireless E-mail Services

From: Nesky, Anthony
Sent: Thursday, June 26, 2014 1:02 PM
To: Lee, Raymond
Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: Question on copyrighted materials and rulemaking

Dear Ray:

We have a number of references in the Subpart W background document that are copyrighted. Stakeholders have asked us to make all references available. Do you know how to handle the copyrighted materials?

Tony Nesky
Center for Radiation Information and Outreach

Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:01 PM
To:	Thornton, Marisa
Subject:	FW: Ute mountain questions

From: Edwards, Jonathan
Sent: Thursday, June 26, 2014 7:04 PM
To: Niebling, William; Rosnick, Reid
Cc: Perrin, Alan; Peake, Tom
Subject: Re: Ute mountain questions

Reid-- please see William's note below. Will you attach a good overview briefing or one-pager that we've used in the past to assist him ? Thanks--Jon

---

From: Niebling, William
Sent: Thursday, June 26, 2014 6:24:01 PM
To: Edwards, Jonathan
Cc: Perrin, Alan; Peake, Tom
Subject: RE: Ute mountain questions

Jonathan, thanks for sharing. It reminds me that I've heard of Subpart W a few times but that I'm not sure I know much about it. If you have a general presentation or briefing doc lying around, no matter how out of date, I'd be curious just to know what it is.
Thanks!
-Wm.

From: Edwards, Jonathan
Sent: Monday, June 23, 2014 6:23 PM
To: Niebling, William
Cc: Perrin, Alan; Peake, Tom
Subject: FW: Ute mountain questions

William --- This is simply an FYI note, to pass on a list of questions that our program received from the Ute Mountain Ute Tribe on our NESHAPS Subpart W rulemaking and related issues. Josh Lewis in OCIR has also received a copy. We thought that it would be good for you to see this since Senator Udall's staff (Colorado) has been contacted by the Ute Mountain Ute's on this issue, and we had a staff-level/OCIR discussion with Sen Udall's staff this past Friday that went fairly well. Any questions, just give us a call or email. Take care, Jon

---

From: Peake, Tom
Sent: Friday, June 20, 2014 11:46 AM
To: Edwards, Jonathan; Perrin, Alan
Cc: Schultheisz, Daniel
Subject: Ute mountain questions

Attached is the list of questions on Subpart W from the Ute.
For clarification: There is a discussion of these questions with the Ute mountain tribe on Wed at 2 pm, with an internal EPA discussion on Tuesday at noon.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:01 PM
To: Thornton, Marisa
Subject: FW: Thank you for attending NTAA/EPA Air Policy Update Conference Call

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From: ITEP Webhost [mailto:customercare@gotowebinar.com]
Sent: Friday, June 27, 2014 3:03 AM
To: Rosnick, Reid
Subject: Thank you for attending NTAA/EPA Air Policy Update Conference Call

Dear Reid,

Thank you for attending my webinar. We hope you enjoyed our event.

Please send your questions, comments and feedback to: monica.begaye@nau.edu.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:02 PM
To: Thornton, Marisa
Subject: FW: References from Background Document that are not available on line
Attachments: missingreferences.docx

From: Nesky, Anthony
Sent: Thursday, June 26, 2014 12:58 PM
To: Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: References from Background Document that are not available on line

Dear Reid:

Attached is a list of references from the Background Information Document that are not available on line. They fall into three categories—

1. Federal Register notices that are too old to be found on line.
2. Copyrighted materials
3. References that have been updated with new materials.

We can scan the Federal Register notices after we get them, but I am not sure how to handle the copyrighted materials. I'll see if Ray Lee has any insights on this.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

YELLOW-means the reference is so old that it is not available on line.
GREEN-means that the reference is copyrightred.

FR (Federal Register) 1979. EPA determination that radionuclides constitute a hazardous air pollutant within the meaning of section 112(a)(1), Volume 44, p. 78738, December 27, 1979.

FR (Federal Register) 1984. EPA withdrew the proposed NESHAPs for Elemental Phosphorus Plants, DOE-Facilities, and NRC-Licensed Facilities. Volume 49, p. 43906. October 23, 1984.

FR (Federal Register) 1985a. EPA promulgated final standards for Elemental Phosphorus Plants, DOE-Facilities, and NRC-Licensed Facilities, Volume 50, p. 7280, February 8, 1985.

FR (Federal Register) 1985b. EPA established a work practice standard for Underground Uranium Mines, Volume 50, p. 15385, April 17, 1985.

FR (Federal Register) 1986. 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants, Standards for Radon-222 Emissions from Licensed Uranium Mill Tailings; Final Rule, Volume 51, p. 34056, September 24, 1986.—**Note: we have a more recent version on the website**

FR (Federal Register) 1989a. National Emission Standards for Hazardous Air Pollutants; Regulation of Radionuclides; Proposed Rule and Notice of Public Hearing, Volume 54, pp. 9612–9668, March 7, 1989.

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SC&A (S. Cohen and Associates) 2011. “Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings, Task 4 – Detailed Risk Estimates,” Contract Number EP-D-10-042, Work Assignment No. 1-04, Task 4, SC&A, Inc., Vienna, Virginia, March 25, 2011.

Schwarzenbach, Rene, P. Philip, M. Gschwend, and Dieter M. Imboden, 2003. Environmental Organic Chemistry, 2nd edition, Chapter 19, Wiley-Interscience, Hoboken, New Jersey, IBSN-0-471-35750-2.

Sun, Hongbing, and David J. Furbish 1995. “Moisture Content Effect on Radon Emanation in Porous Media,” Journal of Contaminant Hydrology 18 (19s 5) 239–255.

Thiel, Richard, and Mark E. Smith, 2004, “State of the Practice Review of Heap Leach Pad Design Issues,” Geotextiles and Geomembranes, 22(5): 555-568.

VDEQ (Virginia Department of Environmental Quality) 2000. “Landfill Cost Estimate Form.” **Note: VDEQ has a more recent form (2012) on their website now.**

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:02 PM
To: Thornton, Marisa
Subject: FW: Please draft a new page for the Subpart W site
Attachments: EIAreferences.docx

From: Nesky, Anthony
Sent: Thursday, June 26, 2014 12:16 PM
To: Romero, Carmen
Cc: Rosnick, Reid; Thornton, Marisa; Herrenbruck, Glenna
Subject: Please draft a new page for the Subpart W site

Dear Carmen:

We now need a reference page on the Subpart W website. Please draft a page to be called:

http://www.epa.gov/radiation/neshaps/subpartw/eiareferences.html

The page content is attached in a Word file. Some entries are highlighted because we don't have links for them yet—please ignore the highlighting and add them to the web page. Please post to the test server so that everyone can review it before publishing it to the web server.

Thanks for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

References from “Background Information Document Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking”

10 CFR 20. Title 10 of the Code of Federal Regulations, Part 20, “Standards for Protection Against Radiation.”

10 CFR 40. Title 10 of the Code of Federal Regulations, Part 40, “Domestic Licensing of Source Material.”

40 CFR 61. Title 40 of the Code of Federal Regulations, Part 61, “National Emission Standards for Hazardous Air Pollutants,” Subpart W, “National Emission Standards for Radon Emissions from Operating Mill Tailings.”

40 CFR 190. Title 40 of the Code of Federal Regulations, Part 190, “Environmental Radiation Protection Standards for Nuclear Power Operations.”

40 CFR 192, Title 40 of the Code of Federal Regulations, Part 192, “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings.”

40 CFR 264, Title 40, Part 264, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.”

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:02 PM
To: Thornton, Marisa
Subject: FW: Notification of Consultation Letter (attached)
Attachments: 071014 Notif of Consultation.pdf

From: Diaz, Angelique
Sent: Wednesday, June 25, 2014 5:28 PM
To: sclow@utemountain.org
Cc: Rosnick, Reid
Subject: Notification of Consultation Letter (attached)

Scott,

Here is the letter sent to Chairman Heart for our July 10^{th} consultation. Let me know if you have any questions.

-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

Reading File

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

JUN 17 2014

Ref: 8P-TA

The Honorable Manuel Heart
Ute Mountain Indian Tribe
P.O. Box JJ
Towaoc, Colorado 81334-0188

Re: Notification of Consultation and Coordination on the 40 CFR Part 61 Subpart W Rulemaking

Dear Chairman Heart:

The U.S. Environmental Protection Agency has received your letter requesting a consultation regarding the 40 CFR Part 61 Subpart W Rulemaking. On behalf of the U.S. Environmental Protection Agency's Office of Air and Radiation (OAR), I am writing to confirm the meeting between the Ute Mountain Indian Tribe, the U.S. EPA's OAR, and the U.S. EPA's Region 8.

This meeting is scheduled pursuant to your request at **9 a.m. to 11:30 a.m., Mountain Daylight Time, on Thursday, July 10, 2014,** and will be conducted in accordance with the *EPA Policy on Consultation and Coordination with Indian Tribes* (www.epa.gov/tribal/consultation/consult-policy.htm).

The official EPA contact for this consultation and coordination process is the EPA Region 8 Tribal Assistance Program Director, Alfreda Mitre. Please do not hesitate to contact Ms. Mitre at (303) 312-6343, or by email at mitre.alfreda@epa.gov if you have any questions.

We look forward to this consultation session and to discussing this important matter.

Sincerely,

Shaun L. McGrath
Regional Administrator

cc: Scott Clow, Environmental Director
Reid Rosnick, U.S. EPA Office of Radiation and Indoor Air

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:03 PM
To: Thornton, Marisa
Subject: FW: White Mesa

From: Palomares, Art
Sent: Wednesday, June 25, 2014 11:48 AM
To: Rosnick, Reid
Subject: White Mesa

Hi Reid,

I want to clarify that it is the Region's understanding that HQ will take the lead on the Proposed Subpart W rule, Tribal Consultation conversation that will occur on July 10th. Also, it's my understanding that you will provide us with a conference line telephone number, is that correct?

I would like to clarify during today's call that the July 10th call is limited to a Tribal Consultation on the Proposed Subpart W rule. So, if I could have a minute to make this point during today's call, I would appreciate it.

Thanks!

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:03 PM
To: Thornton, Marisa
Subject: FW: White Mesa

From: Palomares, Art
Sent: Wednesday, June 25, 2014 1:08 PM
To: Rosnick, Reid
Subject: RE: White Mesa

Reid,

Thanks. Deb Thomas, the Assistant Regional Administrator will be attending the Consultation on-site at the Tribal office. Also, attending in person will be Alfreda Mitre, Tribal Advisor to the Regional Administrator, and Angelique Diaz.

I need the conference telephone line, so that I can be part of the conversation and so that we can have the right folks should other issues come up unrelated to rulemaking.

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

From: Rosnick, Reid
Sent: Wednesday, June 25, 2014 10:50 AM
To: Palomares, Art
Subject: RE: White Mesa

Hi Art,

This is a good point that you have raised, and I think we should make sure that we are all on the same page when we discuss it with the tribe this afternoon.

It's my feeling that the tribe will want to discuss many things related to the uranium recovery process. HQ will most definitely take the lead on issues related to the Subpart W rulemaking activity, and I'll ask the tribe today if they want us to provide a conference call line. It is entirely possible that the tribe will want to discuss issues related to enforcement or to state oversight (we cannot limit them on what they want to discuss), and that's why we went through their questions yesterday, in order to decide who will be necessary either in person, through your RA or DSRA, or on a call line. The questions that are not related to the rulemaking were usually enforcement related or issue with Utah.

Reid

From: Palomares, Art
Sent: Wednesday, June 25, 2014 11:48 AM
To: Rosnick, Reid
Subject: White Mesa

Hi Reid,

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Thanks!

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:03 PM
To: Thornton, Marisa
Subject: FW: White Mesa

From: Rosnick, Reid
Sent: Wednesday, June 25, 2014 1:21 PM
To: Palomares, Art
Subject: RE: White Mesa

Art,

Thanks, and I'll nail down this afternoon on whether the tribe wants to provide a call in number, or whether they will allow EPA to do it.

Reid

From: Palomares, Art
Sent: Wednesday, June 25, 2014 1:08 PM
To: Rosnick, Reid
Subject: RE: White Mesa

Reid,

Thanks. Deb Thomas, the Assistant Regional Administrator will be attending the Consultation on-site at the Tribal office. Also, attending in person will be Alfreda Mitre, Tribal Advisor to the Regional Administrator, and Angelique Diaz.

I need the conference telephone line, so that I can be part of the conversation and so that we can have the right folks should other issues come up unrelated to rulemaking.

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

From: Rosnick, Reid
Sent: Wednesday, June 25, 2014 10:50 AM
To: Palomares, Art
Subject: RE: White Mesa

Hi Art,

This is a good point that you have raised, and I think we should make sure that we are all on the same page when we discuss it with the tribe this afternoon.

It's my feeling that the tribe will want to discuss many things related to the uranium recovery process. HQ will most definitely take the lead on issues related to the Subpart W rulemaking activity, and I'll ask the tribe today if they want us to provide a conference call line. It is entirely possible that the tribe will want to discuss issues related to enforcement or to state oversight (we cannot limit them on what they want to discuss), and that's why we went through their questions yesterday, in order to decide who will be necessary either in person, through your RA or DSRA, or on a call line. The questions that are not related to the rulemaking were usually enforcement related or issue with Utah.

Reid

From: Palomares, Art
Sent: Wednesday, June 25, 2014 11:48 AM
To: Rosnick, Reid
Subject: White Mesa

Hi Reid,

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Thanks!

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:03 PM
To: Thornton, Marisa
Subject: FW: Follow up re Radon Emissions proposed rule?

From: Patefield, Scott
Sent: Wednesday, June 25, 2014 4:16 PM
To: Smith, Paula; Reynolds, Cynthia
Subject: RE: Follow up re Radon Emissions proposed rule?

Paula/Cindy,

I just got out of our consultation preparation meeting with the UMU. I mentioned this call to Art Palomares and he would like to attend this afternoon's call. Hope that's ok!

Scott

From: Smith, Paula
Sent: Tuesday, June 24, 2014 1:16 PM
To: Reynolds, Cynthia; Patefield, Scott
Subject: Fw: Follow up re Radon Emissions proposed rule?

Will try to set something up tomorrow morning with them. Both of you want to be on? Let me know. -Paula

---

From: Lewis, Josh
Sent: Tuesday, June 24, 2014 12:00:58 PM
To: Thomas, Jacqueline (Mark Udall)
Cc: Robinson, Carly (Mark Udall); Smith, Paula
Subject: Follow up re Radon Emissions proposed rule?

Jacqueline/Carly,

Just following up after the call we had last Friday. As I recall, you want to talk further w/ EPA Regional staff who are familiar with the interactions we've had with the state of UT, specifically with regard to the white mesa mill. I'm cc'ing Paula in our Region 8 office, who can set up a call w/ her colleagues there to discuss this further. Will let you all take it from here in terms of scheduling.

Josh Lewis
EPA/Office of Congressional and Intergovernmental Relations
Desk: 202 564 2095
Cell: 202 329 2291

From: Thomas, Jacqueline (Mark Udall) [mailto:Jacqueline_Thomas@MarkUdall.senate.gov]
Sent: Tuesday, June 10, 2014 4:24 PM

To: Lewis, Josh
Cc: Robinson, Carly (Mark Udall)
Subject: Time to chat about recent Radon Emissions proposed rule?

Hi Josh,

Hopefully you're the right person to flag this for. I handle Native American issues for Senator Mark Udall and one of our tribes, the Ute Mountain Ute Tribe, has brought an important issue to our attention. They have some serious concerns with EPA's May proposed rule on the National Emission Standards for Radon Emissions from Operating Mill Tailings.

Do you have time this week to chat with me and my colleague Carly (she handles energy/environment issues) about this issue in further depth? Please let us know some times that work for you.

Thank you,

Jacqueline Thomas
U.S. Senator Mark E. Udall | SH-730 | Washington, DC 20510 | 202.224.5941
Follow Mark Udall: Website | Facebook | YouTube | Twitter
Sign up for Mark's Newsletter

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:03 PM
To: Thornton, Marisa
Subject: FW: Follow up re Radon Emissions proposed rule?

From: Smith, Paula
Sent: Wednesday, June 25, 2014 4:18 PM
To: Patefield, Scott
Subject: RE: Follow up re Radon Emissions proposed rule?

Sure.

- Paula

From: Patefield, Scott
Sent: Wednesday, June 25, 2014 2:16 PM
To: Smith, Paula; Reynolds, Cynthia
Subject: RE: Follow up re Radon Emissions proposed rule?

Paula/Cindy,

I just got out of our consultation preparation meeting with the UMU. I mentioned this call to Art Palomares and he would like to attend this afternoon's call. Hope that's ok!

Scott

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Sent: Tuesday, June 24, 2014 12:00:58 PM
To: Thomas, Jacqueline (Mark Udall)
Cc: Robinson, Carly (Mark Udall); Smith, Paula
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Josh Lewis
EPA/Office of Congressional and Intergovernmental Relations
Desk: 202 564 2095
Cell: 202 329 2291

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To: Lewis, Josh
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Do you have time this week to chat with me and my colleague Carly (she handles energy/environment issues) about this issue in further depth? Please let us know some times that work for you.

Thank you,

Jacqueline Thomas
U.S. Senator Mark E. Udall | SH-730 | Washington, DC 20510 | 202.224.5941
Follow Mark Udall: Website | Facebook | YouTube | Twitter
Sign up for Mark's Newsletter

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:04 PM
To:	Thornton, Marisa
Subject:	FW: Reference Links
Attachments:	REFERENCELINKSCOMPLETED.docx

From: Rosnick, Andrew
Sent: Wednesday, June 25, 2014 11:27 AM
To: Nesky, Anthony
Subject: Reference Links

Embedded Links

10 CFR 20. Title 10 of the Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation."

10 CFR 40. Title 10 of the Code of Federal Regulations, Part 40, "Domestic Licensing of Source Material."

40 CFR 61. Title 40 of the Code of Federal Regulations, Part 61, "National Emission Standards for Hazardous Air Pollutants," Subpart W, "National Emission Standards for Radon Emissions from Operating Mill Tailings."

40 CFR 190. Title 40 of the Code of Federal Regulations, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

40 CFR 192, Title 40 of the Code of Federal Regulations, Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

40 CFR 264, Title 40, Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities."

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From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:04 PM
To: Thornton, Marisa
Subject: FW: Completed Links
Attachments: REFERENCELINKSCOMPLETED.docx

From: Rosnick, Andrew
Sent: Wednesday, June 25, 2014 10:44 AM
To: Nesky, Anthony
Subject: Completed Links

Here is the list, I am not sure what it was but I could not find any of the Federal Register links, maybe I was just looking them up wrong or didn't know what I was looking at but I couldn't seem to find them.

They have been highlighted in the document.

Andrew

10 CFR 20. Title 10 of the Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation." http://www.ecfr.gov/cgi-bin/text-idx?rgn=div5&node=10:1.0.1.1.16

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:04 PM
To: Thornton, Marisa
Subject: FW: FW: List of References Not Available on-line

From: Andrew Rosnick [mailto:arosnick1@gmail.com]
Sent: Tuesday, June 24, 2014 2:37 PM
To: Nesky, Anthony
Subject: Re: FW: List of References Not Available on-line

here is the link for the second one: http://www.radiationcontrol.utah.gov/Uranium_Mills/IUC/Denison_IUC/docs/2011/reclamationplan50/recplan5_0.pdf

I found the link on the website for the first one, however there was nothing that matched that from 2007. There was only 2012 and 2010, but you can see what I am talking about here: http://www.radiationcontrol.utah.gov/Uranium_Mills/IUC/Denison_IUC/docs/2011/reclamationplan50/recplan5_0.pdf

Hope this helps.

Andrew

On Tue, Jun 24, 2014 at 10:10 AM, Nesky, Anthony <Nesky.Tony@epa.gov> wrote:

> Dear Andrew:
>
> Please see if you can find on line references for these two entries from the "not found" list.
>
> Tony Nesky
>
> Center for Radiation Information and Outreach
>
> Tel: 202-343-9597
>
> nesky.tony@epa.gov
>
> ---
>
> **From:** Rosnick, Reid
> **Sent:** Tuesday, June 24, 2014 7:02 AM

To: Nesky, Anthony
Subject: RE: List of References Not Available on-line

Hi Tony,

A quick glance at the list tells me that it can be even shorter that it is. For example,

- Denison Mines (USA) Corp., 2007. "White Mesa Uranium Mill License Renewal Application, State of Utah Radioactive Materials License No.UT1900479, Volume 4 - Environmental Report," February 28, 2007.

- Denison Mines (USA) Corp., 2011. "Reclamation Plan, White Mesa Mill Blanding, Utah, Radioactive Materials License No. UT1900479," Revision 5.0, September 2011.

Can most likely be found at the Utah web site

http://www.radiationcontrol.utah.gov/Uranium_Mills/denison/index.htm

Once we narrow the list to the shortest possible all these document links need to be posted to the Subpart W website under the reference section for the BID/EIA. Concurrently we then need to get them in the docket so there can be no claim of us "hiding" information from stakeholders.

For the documents that absolutely cannot be found we need to go to SC&A and find them, scan them if necessary, and then post them to the website/docket.

Reid

From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:23 PM
To: Rosnick, Reid
Subject: List of References Not Available on-line

Dear Reid:

Here's the list of references for which hard copies are needed.

Tony Nesky

Center for Radiation Information and Outreach

Tel: 202-343-9597

nesky.tony@epa.gov

From: Andrew Rosnick (via Google Docs) [mailto:arosnick1@gmail.com]
Sent: Friday, June 20, 2014 3:18 PM
To: Nesky, Anthony
Subject: Reference List - Links That Could Not Be Found (nesky.tony@epa.gov)

Attached: Reference List - Links That Could Not Be Found

Let me know if this opens for you or not, I did it in Google Docs and then converted it to a .docx file. But these are the links that could not be found that we need someone to get their hand on.

Andrew Rosnick

Google Docs: Create and edit documents online.

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:04 PM
To:	Thornton, Marisa
Subject:	FW: Court Reporter Needed?

From: Nesky, Anthony
Sent: Tuesday, June 24, 2014 5:38 PM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Court Reporter Needed?

Dear Anqelique:

Do you know what the procedure would be for us to provide Region 8 with money for the court reporter? We had planned on using the SRA contract to hire a court report, but the contract which we were using expired, and we will have to fund a new Task Order. I wonder if it will be simpler/cheaper to fund Region 8. Thanks, again, for your help!

Also, I sent you a draft scope of work for the contractor. How many helpers would you like in Denver?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:24 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: Court Reporter Needed?

It has come to my attention that a court reporter is needed for the Subpart W public hearing. Let me know what kind of help you need from Region 8 in identifying one. I am told that for previous hearings HQ provided the money and the Region found the reporter.

Thanks,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:04 PM
To: Thornton, Marisa
Subject: FW: Follow up re Radon Emissions proposed rule?

From: Thomas, Jacqueline (Mark Udall) [mailto:Jacqueline_Thomas@MarkUdall.senate.gov]
Sent: Wednesday, June 25, 2014 10:15 AM
To: Smith, Paula; Robinson, Carly (Mark Udall)
Cc: Reynolds, Cynthia; Patefield, Scott
Subject: RE: Follow up re Radon Emissions proposed rule?

Hi Paula,

Yes, we can do a call today at 5pm EST. Why don't you give us a call at my direct—202-224-5053.

Thanks so much!

Jacqueline Thomas
U.S. Senator Mark E. Udall | SH-730 | Washington, DC 20510 | 202.224.5941
Follow Mark Udall: Website | Facebook | YouTube | Twitter
Sign up for Mark's Newsletter

From: Smith, Paula [mailto:Smith.Paula@epa.gov]
Sent: Wednesday, June 25, 2014 10:06 AM
To: Thomas, Jacqueline (Mark Udall); Robinson, Carly (Mark Udall)
Cc: Reynolds, Cynthia; Patefield, Scott
Subject: RE: Follow up re Radon Emissions proposed rule?

Hello Jacqueline and Carly – I was hoping to set up a call today with you and our Air Program staff regarding White Mesa Mill in Utah. Would either 11:30 or 5:00 EST work for you? If so, please 'reply all' and we will give you a call at any number you suggest. Thanks. Look forward to talking with you.

Paula J. Smith

Director, Office of Communication and Public Involvement

U.S. Environmental Protection Agency, Region 8
1595 Wynkoop
Denver, CO 80202-1129

Phone: 303.312.6630
Cell: 303.882.9550

From: Lewis, Josh
Sent: Tuesday, June 24, 2014 12:01 PM
To: Thomas, Jacqueline (Mark Udall)

Cc: Robinson, Carly (Mark Udall); Smith, Paula
Subject: Follow up re Radon Emissions proposed rule?

Jacqueline/Carly,

Just following up after the call we had last Friday. As I recall, you want to talk further w/ EPA Regional staff who are familiar with the interactions we've had with the state of UT, specifically with regard to the white mesa mill. I'm cc'ing Paula in our Region 8 office, who can set up a call w/ her colleagues there to discuss this further. Will let you all take it from here in terms of scheduling.

Josh Lewis
EPA/Office of Congressional and Intergovernmental Relations
Desk: 202 564 2095
Cell: 202 329 2291

From: Thomas, Jacqueline (Mark Udall) [mailto:Jacqueline_Thomas@MarkUdall.senate.gov]
Sent: Tuesday, June 10, 2014 4:24 PM
To: Lewis, Josh
Cc: Robinson, Carly (Mark Udall)
Subject: Time to chat about recent Radon Emissions proposed rule?

Hi Josh,

Hopefully you're the right person to flag this for. I handle Native American issues for Senator Mark Udall and one of our tribes, the Ute Mountain Ute Tribe, has brought an important issue to our attention. They have some serious concerns with EPA's May proposed rule on the National Emission Standards for Radon Emissions from Operating Mill Tailings.

Do you have time this week to chat with me and my colleague Carly (she handles energy/environment issues) about this issue in further depth? Please let us know some times that work for you.

Thank you,

Jacqueline Thomas
U.S. Senator Mark E. Udall | SH-730 | Washington, DC 20510 | 202.224.5941
Follow Mark Udall: Website | Facebook | YouTube | Twitter
Sign up for Mark's Newsletter

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:05 PM
To: Thornton, Marisa
Subject: FW: 40 CFR Part 61, Subpart W public comment deadline extension request
Attachments: Subpart W extension request letter.docx

From: Nesky, Anthony
Sent: Tuesday, June 24, 2014 2:54 PM
To: Stahle, Susan
Cc: Rosnick, Reid
Subject: FW: 40 CFR Part 61, Subpart W public comment deadline extension request

FYI—we got another request for an extension. I confirmed receipt and sent him the website's message on the extension requests.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Pete Dronkers [mailto:pdronkers@earthworksaction.org]
Sent: Tuesday, June 24, 2014 11:55 AM
To: Rosnick, Reid; Nesky, Anthony
Subject: 40 CFR Part 61, Subpart W public comment deadline extension request

Dear Mr. Rosnick and Nesky,

Please find attached a letter signed by a dozen groups nationwide in support of EPA extending the public comment period for the proposed rulemaking affecting Subpart W, by 120 days.

I would appreciate your confirmation that you have received this letter.

Thank you very much,

--Pete Dronkers

=== EARTHWORKS: Protecting Communities and the Environment

Pete Dronkers
Southwest Circuit Rider
970-259-3353 x3
skype:pete.dronkers-ewa

pdronkers@earthworksaction.org
twitter: earthworksrocks
facebook/earthworksaction

USE YOUR CONSUMER POWER: SIGN THE PLEDGE TO END DIRTY GOLD MINING!
http://pledge.nodirtygold.org

Combined Federal Campaign #41290, Member of EarthShare

Mr. Reid Rosnick and Tony Nesky
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460

Via email to rosnick.reid@epa.gov, nesky.tony@epa.gov

Re: Request for 120-Day Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick and Nesky,

On behalf of Uranium Watch, Eastern Navajo Dine Against Uranium Mining, Laguna Acoma Coalition for a Safe Environment, Bluewater Valley Downstream Alliance, Nuclear Information and Resource Service, Earthworks, Western Colorado Congress, Nebraska Chapter of the Sierra Club, Grand Valley Peace and Justice, Western Nebraska Resource Council, Arizona Mining Reform Coalition, the Multicultural Alliance for a Safe Environment, and Tallahassee Area Community, Inc, we urge you to extend the public comment period deadline for an additional 120 days beyond the current deadline of July 31st, 2014 for the proposed rulemaking affecting 40 CFR Part 61, subpart W.

Given the complexity of this rule, and our desire to understand its implications to communities affected by radon emissions, we believe more time is needed to formulate meaningful comments to EPA and help maximize additional public participation, which should also include hearings in affected areas.

Thanks for your consideration. If you have concerns, questions, or comments, please direct them to the following email addresses.

Sincerely,

The undersigned

Lee J Alter, Tallahassee Community, Inc
alterconsult@starband.net

Pete Dronkers, Earthworks:
pdronkers@earthworksaction.org

Susan Gordon, Multicultural Alliance for a safe Environment:
susangordon@earthlink.net

Sarah Fields, Uranium Watch:
sarah@uraniumwatch.org

Diane D'Arrigo, Nuclear Information and Resource Service:
dianed@nirs.org

Jonathan Perry, Eastern Navajo Dine Against Uranium Mining:
jonperry@yahoo.com

Jonnie Head, Bluewater Valley Downstream Alliance:
head.jonnie@gmail.com

Christine Lowery, Laguna Acoma Coalition for a Safe Environment:
ctlowery@earthlink.net

Rein Van West, Western Colorado Congress:
arcticwild@gmail.com

Buffalo Bruce, Western Nebraska Resource Council and Nebraska Chapter, Sierra Club:
buffalobruce1@gmail.com

Janet Johnson, Grand Valley Peace and Justice:
mjohnson@acsol.net

Roger Featherstone, Arizona Mining Reform Coalition:
roger@azminingreform.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:05 PM
To: Thornton, Marisa
Subject: FW: from Andy Bessler to the NTAA EC - FYI

From: Childers, Pat
Sent: Tuesday, June 24, 2014 2:30 PM
To: Rosnick, Reid
Subject: from Andy Bessler to the NTAA EC - FYI

Radon Emissions from Uranium Mills: As you might remember we submitted a request for a comment period extension that will be discussed on the June 26th EPA Policy call. The rule makers on this, Reid Rosnick, informed me earlier that they are granting the extension but not clear on how long. Cristina and I have been gathering information on this draft rule and will begin the PRK process on this next week as well. Bob Gruenig will also help review and craft this PRK in the coming weeks.

Mr. Reid Rosnick and Tony Nesky
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460

Via email to rosnick.reid@epa.gov, nesky.tony@epa.gov

Re: Request for 120-Day Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick and Nesky,

On behalf of Uranium Watch, Eastern Navajo Dine Against Uranium Mining, Laguna Acoma Coalition for a Safe Environment, Bluewater Valley Downstream Alliance, Nuclear Information and Resource Service, Earthworks, Western Colorado Congress, Nebraska Chapter of the Sierra Club, Grand Valley Peace and Justice, Western Nebraska Resource Council, Arizona Mining Reform Coalition, the Multicultural Alliance for a Safe Environment, and Tallahassee Area Community, Inc, we urge you to extend the public comment period deadline for an additional 120 days beyond the current deadline of July 31st, 2014 for the proposed rulemaking affecting 40 CFR Part 61, subpart W.

Given the complexity of this rule, and our desire to understand its implications to communities affected by radon emissions, we believe more time is needed to formulate meaningful comments to EPA and help maximize additional public participation, which should also include hearings in affected areas.

Thanks for your consideration. If you have concerns, questions, or comments, please direct them to the following email addresses.

Sincerely,

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alterconsult@starband.net

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pdronkers@earthworksaction.org

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susangordon@earthlink.net

Sarah Fields, Uranium Watch:
sarah@uraniumwatch.org

Diane D'Arrigo, Nuclear Information and Resource Service:
dianed@nirs.org

Jonathan Perry, Eastern Navajo Dine Against Uranium Mining:
jonperry@yahoo.com

Jonnie Head, Bluewater Valley Downstream Alliance:
head.jonnie@gmail.com

Christine Lowery, Laguna Acoma Coalition for a Safe Environment:
ctlowery@earthlink.net

Rein Van West, Western Colorado Congress:
arcticwild@gmail.com

Buffalo Bruce, Western Nebraska Resource Council and Nebraska Chapter, Sierra Club:
buffalobruce1@gmail.com

Janet Johnson, Grand Valley Peace and Justice:
mjohnson@acsol.net

Roger Featherstone, Arizona Mining Reform Coalition:
roger@azminingreform.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:05 PM
To: Thornton, Marisa
Subject: FW: 40 CFR Part 61, Subpart W public comment deadline extension request
Attachments: Subpart W extension request letter.docx

From: Pete Dronkers [mailto:pdronkers@earthworksaction.org]
Sent: Tuesday, June 24, 2014 11:55 AM
To: Rosnick, Reid; Nesky, Anthony
Subject: 40 CFR Part 61, Subpart W public comment deadline extension request

Dear Mr. Rosnick and Nesky,

Please find attached a letter signed by a dozen groups nationwide in support of EPA extending the public comment period for the proposed rulemaking affecting Subpart W, by 120 days.

I would appreciate your confirmation that you have received this letter.

Thank you very much,

--Pete Dronkers

=== EARTHWORKS: Protecting Communities and the Environment

Pete Dronkers
Southwest Circuit Rider
970-259-3353 x3
skype:pete.dronkers-ewa
pdronkers@earthworksaction.org
twitter: earthworksrocks
facebook/earthworksaction

USE YOUR CONSUMER POWER: SIGN THE PLEDGE TO END DIRTY GOLD MINING!
http://pledge.nodirtygold.org

Combined Federal Campaign #41290, Member of EarthShare

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:06 PM
To: Thornton, Marisa
Subject: FW: List of References Not Available on-line

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 7:02 AM
To: Nesky, Anthony
Subject: RE: List of References Not Available on-line

Hi Tony,

A quick glance at the list tells me that it can be even shorter that it is. For example,

- Denison Mines (USA) Corp., 2007. "White Mesa Uranium Mill License Renewal Application, State of Utah Radioactive Materials License No.UT1900479, Volume 4 - Environmental Report," February 28, 2007.
- Denison Mines (USA) Corp., 2011. "Reclamation Plan, White Mesa Mill Blanding, Utah, Radioactive Materials License No. UT1900479," Revision 5.0, September 2011.

Can most likely be found at the Utah web site

http://www.radiationcontrol.utah.gov/Uranium_Mills/denison/index.htm

Once we narrow the list to the shortest possible all these document links need to be posted to the Subpart W website under the reference section for the BID/EIA. Concurrently we then need to get them in the docket so there can be no claim of us "hiding" information from stakeholders.

For the documents that absolutely cannot be found we need to go to SC&A and find them, scan them if necessary, and then post them to the website/docket.

Reid

From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:23 PM
To: Rosnick, Reid
Subject: List of References Not Available on-line

Dear Reid:

Here's the list of references for which hard copies are needed.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Andrew Rosnick (via Google Docs) [mailto:arosnick1@gmail.com]
Sent: Friday, June 20, 2014 3:18 PM
To: Nesky, Anthony
Subject: Reference List - Links That Could Not Be Found (nesky.tony@epa.gov)

Attached: Reference List - Links That Could Not Be Found

Let me know if this opens for you or not, I did it in Google Docs and then converted it to a .docx file. But these are the links that could not be found that we need someone to get their hand on.

Andrew Rosnick

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:06 PM
To: Thornton, Marisa
Subject: FW: Subpart W extension request

From: Thornton, Marisa
Sent: Tuesday, June 24, 2014 7:05 AM
To: Rosnick, Reid; Miller, Beth
Subject: RE: Subpart W extension request

Hey Reid,

This information is already up live. During our call with Susan you asked me to move that information from the table this section below. My apologies if I misunderstood your request. Let me know if you want me to back.

Requests for Extension of the Public Comment Period

EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.

- Request from Uranium Watch (PDF) (2 pp, 58.9 KB About PDF)
- Request from NTAA (PDF) (1 pp, 32.4 KB About PDF)
- Letter from Jennifer Thurston 6-19-14 (PDF) (1 pp, 60K)
- Hearing Request (PDF) (5 pp, 82K)

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 6:30 AM
To: Miller, Beth; Thornton, Marisa
Subject: FW: Subpart W extension request

Ladies,

Please place this letter in the docket (Beth) and the Subpart W website (Marisa) Thanks!

Reid

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Friday, June 20, 2014 5:25 PM
To: Rosnick, Reid
Subject: Subpart W extension request

Dear Mr Rosnick,

I have attached a letter for your consideration related to the Subpart W rulemaking.

Could you kindly confirm that you received this request, as well as the group letter I sent yesterday to request public hearings.

Thank you in advance,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:06 PM
To: Thornton, Marisa
Subject: FW: Subpart W extension request

From: Thornton, Marisa
Sent: Tuesday, June 24, 2014 7:18 AM
To: Rosnick, Reid; Miller, Beth
Subject: RE: Subpart W extension request

Lol…ok…sorry for all the typos…it's still early…

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 7:13 AM
To: Thornton, Marisa; Miller, Beth
Subject: RE: Subpart W extension request

No, You're doing fine! Our problem right now is that stuff is coming in so fast we need an umbrella!

From: Thornton, Marisa
Sent: Tuesday, June 24, 2014 7:05 AM
To: Rosnick, Reid; Miller, Beth
Subject: RE: Subpart W extension request

Hey Reid,

This information is already up live. During our call with Susan you asked me to move that information from the table this section below. My apologies if I misunderstood your request. Let me know if you want me to back.

Requests for Extension of the Public Comment Period

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- Request from NTAA (PDF) (1 pp, 32.4 KB About PDF)

- Letter from Jennifer Thurston 6-19-14 (PDF) (1 pp, 60K)
- Hearing Request (PDF) (5 pp, 82K)

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 6:30 AM
To: Miller, Beth; Thornton, Marisa
Subject: FW: Subpart W extension request

Ladies,

Please place this letter in the docket (Beth) and the Subpart W website (Marisa) Thanks!

Reid

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Friday, June 20, 2014 5:25 PM
To: Rosnick, Reid
Subject: Subpart W extension request

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Thank you in advance,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:05 PM
To: Thornton, Marisa
Subject: FW: List of References Not Available on-line

From: Nesky, Anthony
Sent: Tuesday, June 24, 2014 10:10 AM
To: Andrew Rosnick (via Google Docs)
Subject: FW: List of References Not Available on-line

Dear Andrew:

Please see if you can find on line references for these two entries from the "not found" list.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 7:02 AM
To: Nesky, Anthony
Subject: RE: List of References Not Available on-line

Hi Tony,

A quick glance at the list tells me that it can be even shorter that it is. For example,

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- Denison Mines (USA) Corp., 2011. "Reclamation Plan, White Mesa Mill Blanding, Utah, Radioactive Materials License No. UT1900479," Revision 5.0, September 2011.

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http://www.radiationcontrol.utah.gov/Uranium_Mills/denison/index.htm

Once we narrow the list to the shortest possible all these document links need to be posted to the Subpart W website under the reference section for the BID/EIA. Concurrently we then need to get them in the docket so there can be no claim of us "hiding" information from stakeholders.

For the documents that absolutely cannot be found we need to go to SC&A and find them, scan them if necessary, and then post them to the website/docket.

Reid

From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:23 PM
To: Rosnick, Reid
Subject: List of References Not Available on-line

Dear Reid:

Here's the list of references for which hard copies are needed.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Andrew Rosnick (via Google Docs) [mailto:arosnick1@gmail.com]
Sent: Friday, June 20, 2014 3:18 PM
To: Nesky, Anthony
Subject: Reference List - Links That Could Not Be Found (nesky.tony@epa.gov)

Attached: Reference List - Links That Could Not Be Found

Let me know if this opens for you or not, I did it in Google Docs and then converted it to a .docx file. But these are the links that could not be found that we need someone to get their hand on.

Andrew Rosnick

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:06 PM
To: Thornton, Marisa
Subject: FW: Subpart W extension request
Attachments: SubpartW-extension-request.pdf; ATT00001.htm

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 6:30 AM
To: Miller, Beth; Thornton, Marisa
Subject: FW: Subpart W extension request

Ladies,

Please place this letter in the docket (Beth) and the Subpart W website (Marisa) Thanks!

Reid

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Friday, June 20, 2014 5:25 PM
To: Rosnick, Reid
Subject: Subpart W extension request

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I have attached a letter for your consideration related to the Subpart W rulemaking.

Could you kindly confirm that you received this request, as well as the group letter I sent yesterday to request public hearings.

Thank you in advance,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

INFORM

INFORMATION NETWORK FOR
RESPONSIBLE MINING

PO Box 27
NORWOOD, CO 81423

(970) 497-4482
JENNIFER@INFORMCOLORADO.ORG
WWW.INFORMCOLORADO.ORG

June 20, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air, Mail Code 6608
Radiation Protection Division
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue N.W.
Washington, D.C., 20460

Via email to rosnick.reid@epa.gov

Re: Request for Extension of Comment Deadline, Docket ID No. EPA-HQ-OAR-2008-0218

Dear Mr. Rosnick,

Please extend the public comment period for EPA's Rulemaking for Revisions to the National Emission Standards for Radon Emissions from Operating Mill Tailings. Comments are due July 31, 2014, but EPA should consider extending the deadline by 120 days.

As you know, the Subpart W Rulemaking is of critical importance to affected communities and people who live in Uranium Country and there is a high degree of interest in participating in the rulemaking as well as a high degree of interest in seeing the current rule strengthened. It is also a serious, complex rule that is difficult for lay people to grapple with and it takes a lengthy amount of time to study the issues and prepare responses. A number of organizations who have a stake in the rulemaking represent community members who lack the resources that industry has to hire technical experts and services to review the rule. EPA should extend the deadline by a considerable period and accommodate the legitimate need for more time that affected citizens have in this process. This will result in a better decision-making process by increasing people's ability to participate.

Thank you again for your consideration.

Sincerely,

Jennifer Thurston
Director

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:07 PM
To: Thornton, Marisa
Subject: FW: Court Reporter Needed?

From: Nesky, Anthony
Sent: Monday, June 23, 2014 6:24 PM
To: Rosnick, Reid
Subject: RE: Court Reporter Needed?

I did cost that in, but the contract will expire before the hearings, and I am in the process of drafting a new Task Order, which we will have to fund. So, my question is: what is easier, funding the Region or funding the contractor. If we are going to provide a helper, we will have to fund the contract anyway.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
Sent: Monday, June 23, 2014 6:22 PM
To: Nesky, Anthony
Subject: RE: Court Reporter Needed?

Tony,

Correct me if I'm wrong, but didn't you cost a court reporter in your work assignment request? It really doesn't matter to me, if the Region can get a good deal then we should go with it.

Reid

From: Nesky, Anthony
Sent: Monday, June 23, 2014 3:33 PM
To: Rosnick, Reid
Subject: FW: Court Reporter Needed?

What do you think, Reid? Will it be easier/cheaper to go through the Region, or to use the contractor?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:24 PM
To: Nesky, Anthony

Cc: Rosnick, Reid
Subject: Court Reporter Needed?

It has come to my attention that a court reporter is needed for the Subpart W public hearing. Let me know what kind of help you need from Region 8 in identifying one. I am told that for previous hearings HQ provided the money and the Region found the reporter.

Thanks,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:06 PM
To: Thornton, Marisa
Subject: FW: Court Reporter Needed?

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 6:14 AM
To: Nesky, Anthony
Subject: RE: Court Reporter Needed?

Tony,

don't have an answer for you. If you think the Region can do it cheaper, I would go with them.

From: Nesky, Anthony
Sent: Monday, June 23, 2014 6:24 PM
To: Rosnick, Reid
Subject: RE: Court Reporter Needed?

I did cost that in, but the contract will expire before the hearings, and I am in the process of drafting a new Task Order, which we will have to fund. So, my question is: what is easier, funding the Region or funding the contractor. If we are going to provide a helper, we will have to fund the contract anyway.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Rosnick, Reid
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To: Nesky, Anthony
Subject: RE: Court Reporter Needed?

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Sent: Monday, June 23, 2014 3:33 PM
To: Rosnick, Reid
Subject: FW: Court Reporter Needed?

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Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:24 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: Court Reporter Needed?

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Thanks,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
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1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:06 PM
To: Thornton, Marisa
Subject: FW: Court Reporter Needed?

From: Rosnick, Reid
Sent: Tuesday, June 24, 2014 6:16 AM
To: Nesky, Anthony
Subject: FW: Court Reporter Needed?

Tony,

I think your answer is below.

Reid

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:24 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: Court Reporter Needed?

It has come to my attention that a court reporter is needed for the Subpart W public hearing. Let me know what kind of help you need from Region 8 in identifying one. I am told that for previous hearings HQ provided the money and the Region found the reporter.

Thanks,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
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diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:07 PM
To: Thornton, Marisa
Subject: FW: Ute mountain questions
Attachments: NESHAPS Questions for EPA FINAL.pdf

From: Edwards, Jonathan
Sent: Monday, June 23, 2014 6:23 PM
To: Niebling, William
Cc: Perrin, Alan; Peake, Tom
Subject: FW: Ute mountain questions

William --- This is simply an FYI note, to pass on a list of questions that our program received from the Ute Mountain Ute Tribe on our NESHAPS Subpart W rulemaking and related issues. Josh Lewis in OCIR has also received a copy. We thought that it would be good for you to see this since Senator Udall's staff (Colorado) has been contacted by the Ute Mountain Ute's on this issue, and we had a staff-level/OCIR discussion with Sen Udall's staff this past Friday that went fairly well. Any questions, just give us a call or email. Take care, Jon

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From: Peake, Tom
Sent: Friday, June 20, 2014 11:46 AM
To: Edwards, Jonathan; Perrin, Alan
Cc: Schultheisz, Daniel
Subject: Ute mountain questions

Attached is the list of questions on Subpart W from the Ute.
For clarification: There is a discussion of these questions with the Ute mountain tribe on Wed at 2 pm, with an internal EPA discussion on Tuesday at noon.

UTE MOUNTAIN UTE TRIBE'S INITIAL QUESTIONS
Environmental Protection Agency, Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings, Proposed Rule
40 C.F.R. Part 61
Submitted on June 13, 2014 in preparation for government-to-government consultation, July 10, 2014

I. EPA, INDIAN TRIBES, AND EXECUTIVE ORDER 13175

1. The Environmental Protection Agency's (EPA) statement regarding compliance with Executive Order 13175 states that the Subpart W rulemaking action does not have "tribal implications" because the rulemaking does not impose regulatory requirements on tribal governments. Please be prepared to discuss how the following issues impact the EPA's Executive Order 13175 analysis:

    - Although Native Americans make up only 1.4 percent of Utah's racial profile (and 0.9 percent of the United States' racial profile), they make up 55.8 percent of the racial profile for San Juan County, Utah (the county where the White Mesa Mill (WMM) is located).
    - The WMM facility is located on aboriginal lands of the Ute Mountain Ute Tribe.
    - The WMM facility is located adjacent to land and other Indian Trust Assets held in trust by the United States on behalf of the Ute Mountain Ute Tribe (and less than 3 miles from the nearest Tribal resident).
    - The Tribal community located in White Mesa is downgradient of the WMM facility.
    - The Tribal community located in White Mesa is completely dependent on groundwater supplies located underneath the WMM facility and tailings cells.
    - Activities and operations at the WMM have already impacted Tribal members' abilities to use surface, plant, wildlife, and surface water resources on public and Tribal lands.

2. Please be prepared to discuss how the EPA will address Tribal concerns during this Subpart W rulemaking and related rulemaking processes (including, but not limited to, the anticipated revision to 40 C.F.R. Part 192).

3. Please be prepared to discuss how or whether the EPA undertook analysis of how this rulemaking will impact UMU Tribal members, UMU Tribal lands, and Indian Trust Assets.

II. NESHAPS/CLEAN AIR ACT QUESTIONS

4. Has the EPA evaluated establishing a lesser quantity or different criteria for major sources of radionuclides under Section 112(a)(1) of the CAA? *See* footnote 2, page 25390 of the proposed rulemaking (noting that *none* of the uranium recovery facilities are major sources under NESHAPS).

5. On page 25390 of the proposed rulemaking, the EPA identifies the "source category" for Subpart W using 40 C.F.R. § 61.250 and the proposed definition of "uranium recovery facility." Has the EPA listed uranium recovery facilities as a category or subcategory of sources under Section 112(c) of the Clean Air Act? If so, please provide an explanation and documentation in advance of the consultation meeting.

6. On page 25390 of the proposed rulemaking, the EPA states, "Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings." However, the proposed Subpart W rulemaking only covers some HAP sources at uranium recovery facilities, and not others (such as stackhouses, ore pad, ore grinder, and the Mill yard, see Question 7, *infra*). Please explain the EPA's rationale for excluding such HAP sources at conventional uranium mills.

7. On page 25390 of the proposed rulemaking, the EPA states: "We presently have no data or information that shows any other HAPs being emitted from these impoundments." Please provide a response to the following initial questions, data, and information regarding other HAPs that may be emitted from the WMM.

    - The WMM's 10 C.F.R. § 40.65 environmental airborne particulate monitoring program monitors for natural uranium (Uranium-238, Uranium-234, Uranium-235), Thorium-230, Radium-226, and Lead-210. This air monitoring program has detected all four isotopes at all of the air monitoring stations. Additionally, the WMM has identified Lead-210, Thorium-230, Thorium-232, Polonium-210, Radium-226, and Radium-228 in wastewater samples from the tailings impoundments. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
    - The WMM processes uranium ore. During the uranium storage and milling processes, there may be more than three dozen radioactive isotopes present at the WMM facility (including actinium, astatine, bismuth, francium, lead, polonium, protactinium, radium, radon, thallium, thorium, and uranium). *See* Uranium Decay Series diagram on page 44 of the Technical and Regulatory Support document. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
    - The WMM's uranium milling process uses significant quantities of chemicals (sodium chlorate is used during ore oxidation; sulfuric acid and flocculants are used during the leaching and clarification; secondary amines/kerosene, tri-alkyl amines/tributyl phosphate modifier, and quaternary ammonium compounds/alcohol are used during the solvent extraction; chlorides and sulfates are used during pregnant liquor stripping; and ammonia hydroxide and sodium hydroxide during yellowcake precipitation). During the storage and use of these chemicals, and after these chemicals are disposed in the tailings impoundments, there may be significant emissions of HAPs at the WMM.

- The WMM processes alternate feed materials. During the alternate feed storage and milling processes, other radioactive isotopes, non-metal compounds, and other regulated HAPs may be emitted from the WMM.
- The WMM processes vanadium ore. Vanadium is considered to be dangerous to life and health by both the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health, and may be listed as a HAP in the future. The WMM's vanadium recovery process uses a significant quantity of chemicals (sodium chlorate is used during the redox/pH adjustment; kerosene and secondary amines are used during the solvent extraction; soda ash is used during the vanadium pregnant liquor stripping process; and ammonia hydroxide is used during the vanadium precipitation). This indicates that the vanadium recovery process results in the emission of HAPs other than Radon-222 from the WMM facility.

8. On page 25390 of the proposed rulemaking, the EPA states that it evaluated the MACT standards applicable to major sources in the same industrial sector. Please provide the Tribe with this analysis prior to the consultation, and be prepared to explain the MACT analysis that the EPA performed during this rulemaking process.

9. Please explain how the EPA evaluated the use of a work practice standard, rather than an emissions standard, for the control of a HAP under the proposed rulemaking. *See* Section 112(h), Clean Air Act. Please specifically address the EPA's determination to remove the current emissions standard for existing impoundments. Please also explain how removing the emissions standard from Subpart W will affect: (a) how the WMM facility sets and meets the ALARA goal to protect worker and adjacent communities from radionuclides; and (b) monitoring of radon emissions under 10 C.F.R. Part 40, Appendix A.

III. SUBPART W AND CLOSURE OF LEGACY IMPOUNDMENTS

10. In 1989, when the EPA proposed the current Subpart W NESHAP, the EPA concluded that, "Existing mill tailing piles are large piles of waste that emit radon. There is nothing that can be done to reduce the amount of radon they emit except cover them." 54 FR 9644 (March 7, 1989). EPA crafted Subpart W to prohibit uranium mills from having more than two tailings impoundments in operation. Explain why the EPA has not required closure of the legacy Tailings Cells 1, 2, and 3 at the WMM, as contemplated and required by the current NESHAP.

11. In this proposed rulemaking, the EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Explain how the EPA can justify the long-term risk of having almost 300 acres of tailings impoundments that are either in operation or in closure but without a permanent radon barrier at the WMM. *See also* questions on conventional and non-conventional impoundments.

IV. DEFICIENT OR INCORRECT ANALYSIS OF OPERATIONS AND FACILITIES AT THE WMM

12. The owners of the WMM state in the June 1, 2009 letter response to EPA's CAA Section 114 Information Request that Tailings Cells 1, 2, and 3 meet the requirements of 40 C.F.R. 192.32(a). The WMM owners specify that these specific Tailings Cells meet the design and operating requirements under 40 C.F.R. 264.221(a). Please explain how the EPA evaluated the WMM owners' assertions regarding compliance with 40 C.F.R. 192.32(a) and 40 C.F.R. 264.221(a), given the following:
    - The liners in Tailings Cells 1, 2, and 3 were designed for a 15-year life and were installed between May 1980 and September 1982. These impoundments have already been in operation for over 30 years.
    - Contamination of the shallow groundwater underlying Tailings Cells 1, 2, and 3 has been documented and is the subject of investigation and corrective action to address elevated chloroform, nitrate and chlorides. There is significant evidence that the liners on Tailings Cells 1, 2, and 3 have already allowed migration of waste out of the impoundments into the adjacent groundwater.
    - The Agreement State and the WMM owners treat the shallow groundwater aquifer under the WMM facility as the leak detection system for Tailings Cells 1, 2, and 3 (and developed a groundwater monitoring program that can detect tailings cell leakage only after waste has migrated out of these legacy impoundments).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 do not have appropriate chemical properties and sufficient strength and thickness to prevent failure due to conditions outlined in 40 C.F.R. § 264.221(a)(1).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 are not compatible with alternate feed materials contained in the impoundments.

13. Several important sections of the proposed rulemaking rely on the provisions of 40 C.F.R. § 264.221(c) (and not 40 C.F.R. § 264.221(a)) to explain protection of groundwater or other environmental analysis. *See, e.g.*, page 25393 (setting forth specific liner requirements from 40 C.F.R. § 264.221(c)); page 25397 (specifically relying on safeguards from a leak detection system); page 25401 (specifying that the proposed GACT is for double liners on non-conventional impoundments). The provisions of 40 C.F.R. § 264.221(c) are significantly more protective of groundwater, human health, and the environment.

    - Is the EPA taking the position that all conventional impoundments and non-conventional impoundments must meet the requirements of 40 C.F.R. § 264.221(c)? If so, please clarify the EPA's position on whether Tailings Cells 1, 2, and 3 at the WMM meet the requirements of 40 C.F.R. § 264.221(c).

    - If the EPA is <u>not</u> taking the position that 40 C.F.R § 264.221(c) applies to all conventional and non-conventional impoundments, please explain how the EPA addressed risks to groundwater from legacy impoundments like Tailings Cells 1,

2, and 3. Please specifically address how the EPA assessed the risk of groundwater contamination from Tailings Cell 1. *See* question 12, *supra*.

14. Please explain how (or if) the EPA's specific analysis of the WMM facility addressed the following:

- Cell 2 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
- Method 115 monitoring on Cell 2 detected a Subpart W NESHAPS violation in 2012/2013 over the 20 pCi/m2-s limit.
- Cell 3 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
- Cell 3 is currently the only tailings cell at the WMM that receives certain forms of 11(e)(2) byproduct material (materials trucked in, including ISL waste).
- The WMM facility has not historically operated its "conventional" and "non-conventional" tailings impoundments separately. Tailings Cell 4A was operated as a "non-conventional" impoundment, which resulted in surface and groundwater contamination until the cell was retrofitted starting in 2008. Tailings Cell 4B is currently operated as a "non-conventional" impoundment, but the WMM owners indicate that it will be used as a "conventional" impoundment in the future.
- Under currently approved and proposed reclamation plans for the WMM, the permanent radon barriers will not be placed on *any* tailings impoundments until final reclamation at the facility.

V. NON-CONVENTIONAL IMPOUNDMENTS

15. How did the EPA develop the proposed definition of "non-conventional impoundments"?

16. Please explain how the EPA will distinguish between conventional and non-conventional impoundments.

    a. Is there a minimum amount of liquid that must be present in the pond for the EPA to classify a tailings impoundment as a non-conventional impoundment, or can a facility owner convert a conventional impoundment into a non-conventional impoundment by adding the minimum 1m of liquid on the top of the impoundment?

    b. Will the final reclamation or removal plan for a tailings impoundment determine whether it qualifies as a "non-conventional impoundment"?

        o Please explain how the EPA will treat Tailings Cell 1 at the WMM (noting that the WMM owners plan to remove solids from the cell upon final reclamation, but then permanently dispose of debris from the Mill facilities and contaminated soil in the cell). *See* June 1, 2009 Response Letter at 6; page 25405 of the proposed rulemaking (addressing the disposal of byproduct material like deconstruction material during facility reclamation).

- Please explain how the EPA will treat Tailings Cell 4B at the WMM (which the WMM owner is currently operating as a non-conventional impoundment, but which will become a conventional impoundment before final reclamation).

17. The WMM is currently authorized to temporarily place liquid 11(e)(2) byproduct material in "Roberts Pond" (before pumping the liquid into Tailings Cells 1 and 4B). Does Roberts Pond meet the proposed definition of a "non-conventional impoundment"? *See* pages 25390, 25393 of the proposed rulemaking (addressing "holding" and "collection" ponds). Please explain how EPA has assessed the Radon-222 emissions from Roberts Pond and from the regular transfer of process water from Roberts Pond to Tailings Cells 1 and 4B.

18. Please explain the EPA's rationale for allowing non-conventional impoundments to exist until removal at facility closure.

    - Did the EPA analyze whether allowing water-covered impoundments to exist for the life of a facility increases risks of groundwater and surface water contamination? Please see question 12 (and explain EPA's position on the 15-year design life for Tailings Cell 1 at the WMM).
    - How will the EPA ensure that non-conventional impoundments are periodically retrofitted to ensure that the impoundments do not contaminate groundwater and surface water?

19. EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Please explain why this linear relationship does not also justify size restrictions on non-conventional impoundments (and please specifically address how this linear relationship will impact Radon-222 emissions when large non-conventional impoundments are dewatered and closed).

20. How has the EPA analyzed what risks non-conventional impoundments (including large non-conventional impoundments like Tailings Cell 1 at the WMM) will pose to human health and the environment when they are de-watered and decommissioned?

21. How will the proposed rule address tailings impoundments that are used as conventional and non-conventional impoundments (such as Tailings Cells 4A and 4B at the WMM)? How will the EPA "count" these cells using the 2-cell limit in the conventional impoundment work practice standard?

22. The EPA's analysis that using liquids to cover tailings cells "has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero" is insufficient to demonstrate that Tailings Cell 1 at the WMM has a radon flux of "almost zero" (or even under 20 pCi/m2-s).

Based on the information and questions below, please provide the EPA's specific analysis of the calculated radon emissions from Tailings Cell 1, Tailings Cell 4B, and Roberts Pond at the WMM. Please then explain how EPA calculates the dose to the White Mesa Tribal community (considering radon emissions from Tailings Cell 1 and 4B and Roberts Pond, along with radon emissions from "conventional" impoundments 2, 3, and 4A).

a. The proposed rulemaking recognizes that covering tailings impoundments with water does not reduce radon emissions to zero. *See, e.g.*, Radon Emission from Evaporation Ponds (noting that the radon flux above some evaporation ponds can be significant/exceed 20 pCi/m2-s).
b. The proposed rulemaking contemplates the use of radium-laden "process water" to provide liquid covers on non-conventional impoundments, but does not address whether the use of radium-laden process water increases the radon emissions from a non-conventional impoundment. The EPA analysis justifying the use of the 1 meter water cover relies on the assumption that the water cover is not laden with radium. The EPA analysis also calculates significant radon flux from non-conventional impoundments containing radium-laden water. Please justify the EPA's position that 1 m of radium-laden process water can decrease radon flux from tailings impoundments like Tailings Cell 1 at WMM to zero.
c. The EPA's analysis of radon emissions from liquid-covered impoundments recognizes that there are significant radon emissions during the transfer of radium-laden waters to and between tailings impoundments and during enhanced evaporation sprays, but it does not calculate or address these emissions for conventional mills like the WMM.
d. Using the radon flux equation contained in Section 4.0 of the Radon Emissions from Evaporation Ponds report along with the actual radium content[1] in Tailings Cell 1, the Tribe's initial calculation on the radon flux from Tailings Cell 1 is 327 pCi/m2-s (not including emissions during transfer into Cell 1 or during enhanced evaporation sprays).

VI. CONVENTIONAL IMPOUNDMENTS

23. The Tribe is generally confused about the EPA's approach to Tailings Cells 2 and 3 at the WMM. The EPA seems to recognize that neither of these tailings cells meets the work practice standards proposed in this rulemaking. *See* page 25395 of the proposed rulemaking (noting that Cell 3 could not meet the work practice standards). Given that both tailings impoundments are still licensed by the Agreement State to receive liquid and solid 11(e)(2) byproduct material and that neither tailings impoundment has a tailings closure plan with milestones for placement of a permanent radon barrier, please explain how the EPA can continue to justify removing the monitoring requirements and emissions limits that currently apply to these impoundments.

[1] To determine the actual radium content, the Tribe used the 32,700 pCi/L Gross Radium Alpha concentration provided in the in the 2013 Annual Tailings Report.

24. The Tribe is concerned that, although Tailings Cell 2 had a recent violation of the 20 pCi/m2-s emissions limit that applies to existing impoundments (and although that violation was detected during monitoring conducted under Method 115), the EPA did not consider Cell 2 when considering how the proposed rulemaking would impact the WMM. Please explain why the EPA omitted any analysis of Cell 2 and the recent Subpart W violation at Cell 2. Please also explain how the EPA will ensure that emissions from Tailings Cell 2 do not exceed 20 pCi/m2-s between now and when the final radon barrier is placed during final reclamation of the entire facility (given that the EPA is proposing to eliminate both the emissions limit and the monitoring to detect Radon-222 emissions over 20 pCi/m2-s).

25. The proposed rulemaking references the use of an "interim cover" on Tailings Cells 2 and 3 at the WMM. The Tribe is concerned that the WMM owners have used this "interim cover" on Tailings Cell 2 for more than a decade (and that the use of this cover has already resulted in Radon-222 emissions of over the 20 pCi/m2-s limit) and that the Reclamation Plan for the WMM contemplates the use of such "interim covers" until final reclamation at the facility. Please explain whether and how the EPA justifies the use of interim covers (and not the immediate placement of permanent radon barriers).

VII. APPLICABILITY OF 40 C.F.R. PART 192

26. A significant portion of the EPA's analysis in the proposed rulemaking (including analysis on impacts to the environment and human health, analysis on weather and other hazards, and economic analysis) rests on the assumption that all tailings impoundments (conventional and non-conventional) meet the standards set forth in 40 C.F.R. § 192.32(a)(1) and 40 C.F.R. § 264.221. How will the EPA ensure that all the tailings impoundments at the WMM facility meet the applicable federal standards?

27. The EPA is proposing to eliminate internal cross references to the sections of 40 C.F.R. Part 192 that cover placement of permanent radon barriers on tailings impoundments. Additionally, although the EPA identified the need to better define "closure" under Subpart W, the revisions to the terms "standby" and "operation" in the proposed rulemaking do not define or address "closure" under the revised Subpart W NESHAP regulations.
    - How will the EPA determine whether a tailings impoundment has entered "final closure" for Subpart W NESHAP purposes?
    - If the EPA no longer intends to utilize other portions of 40 C.F.R. Part 192 (including, but not limited to, the definitions of "Tailings Closure Plan," "Permanent Radon Barrier," and requirements that the permanent radon barrier be constructed as expeditiously as possible and in accordance with a tailings closure plan), how will the EPA ensure that permanent radon barriers are properly placed on tailings cells? Here, please address the Tribe's concern that, under current reclamation plans for the WMM, the permanent radon barriers for Cells 2 and 3 will not be placed under final reclamation of the facility (and that there are no Tailings Closure Plans, as defined in 40 C.F.R. Part 192, with milestones for the expeditious placement of the permanent radon barriers).

28. The Tribe is concerned that the Tribal community in White Mesa will be exposed to elevated levels of Radon-222 when the WMM facility undertakes de-watering or other closure activities or allows Tailings Cells 2 and 3 to remain open under an “interim cover.” Please explain how the EPA has specifically assessed the anticipated dose to the White Mesa Community *during* the closure period. Please also explain how the EPA will ensure that Tribal members, Tribal lands and other Indian Trust Assets are not exposed to Radon-222 emissions in excess of 20 pCi/m2-s during the closure period.

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:09 PM
To:	Thornton, Marisa
Subject:	FW: Ute mountain questions

From: Edwards, Jonathan
Sent: Monday, June 23, 2014 8:32 AM
To: Perrin, Alan
Subject: Re: Ute mountain questions

I can send it on. Thanks.

From: Perrin, Alan
Sent: Monday, June 23, 2014 6:57:55 AM
To: Edwards, Jonathan
Subject: Re: Ute mountain questions

I would guess that they have not been forwarded. We can check with Tom, but I did note send on Friday.

Assuming it hasn't gone, would you like me to forward, or would you like to move it?

From: Edwards, Jonathan
Sent: Sunday, June 22, 2014 8:51:15 PM
To: Perrin, Alan
Subject: FW: Ute mountain questions

Alan--- do you know if these questions ever got forwarded to William N. in OAR IO as discussed during our last general?
Thanks, Jon

From: Peake, Tom
Sent: Friday, June 20, 2014 11:46 AM
To: Edwards, Jonathan; Perrin, Alan
Cc: Schultheisz, Daniel
Subject: Ute mountain questions

Attached is the list of questions on Subpart W from the Ute.
For clarification: There is a discussion of these questions with the Ute mountain tribe on Wed at 2 pm, with an internal EPA discussion on Tuesday at noon.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:08 PM
To: Thornton, Marisa
Subject: FW: These are the References with their links, excluding the ones not found

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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 1:12 PM
To: Nesky, Anthony
Subject: These are the References with their links, excluding the ones not found

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10 CFR 40. Title 10 of the Code of Federal Regulations, Part 40, "Domestic Licensing of Source Material."
40 CFR 61. Title 40 of the Code of Federal Regulations, Part 61, "National Emission Standards for Hazardous Air Pollutants," Subpart W, "National Emission Standards for Radon Emissions from Operating Mill Tailings."
40 CFR 190. Title 40 of the Code of Federal Regulations, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."
40 CFR 192, Title 40 of the Code of Federal Regulations, Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."
40 CFR 264, Title 40, Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities."
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From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:05 PM
To: Rosnick, Andrew
Subject: Reference List

See attached.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:08 PM
To: Thornton, Marisa
Subject: FW: Save the Date: Subpart W Public Hearing

From: Diaz, Angelique
Sent: Monday, June 23, 2014 2:28 PM
To: Sutin, Elyana
Cc: Rothery, Deirdre; Jackson, Scott
Subject: RE: Save the Date: Subpart W Public Hearing

Wow, that's exciting! Thank you.

Let's plan on having Dee and/or Scott trained too as a backup. Let me know the best way to get that scheduled, and how much time is needed.

Thanks again,
Angelique

Angelique D. Diaz, Ph.D.
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Denver, CO 80202-1129
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-----Original Appointment-----
From: Sutin, Elyana
Sent: Monday, June 23, 2014 11:12 AM
To: Diaz, Angelique
Subject: Accepted: Save the Date: Subpart W Public Hearing
When: Occurs every day effective 9/3/2014 until 9/4/2014 from 8:00 AM to 5:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: EPA Conference Center

Angelique-

I am returning from taking my daughter to college on the East Coast on 9/2. Assuming there are no flight issues, I am available on the 3rd and 4th.

Thanks,

Elyana

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:08 PM
To: Thornton, Marisa
Subject: FW: These are the References with their links, excluding the ones not found

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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 2:34 PM
To: Nesky, Anthony
Subject: RE: These are the References with their links, excluding the ones not found

CFR References have been added.

From: Nesky, Anthony
Sent: Monday, June 23, 2014 1:56 PM
To: Rosnick, Andrew
Subject: RE: These are the References with their links, excluding the ones not found

Thanks! Please add the CFR references, but make sure that you use the link to the Code of Federal Regulations website only. Thanks!

Tony Nesky
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nesky.tony@epa.gov

From: Rosnick, Andrew
Sent: Monday, June 23, 2014 1:12 PM
To: Nesky, Anthony
Subject: These are the References with their links, excluding the ones not found

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10 CFR 40. Title 10 of the Code of Federal Regulations, Part 40, "Domestic Licensing of Source Material."
40 CFR 61. Title 40 of the Code of Federal Regulations, Part 61, "National Emission Standards for Hazardous Air Pollutants," Subpart W, "National Emission Standards for Radon Emissions from Operating Mill Tailings."
40 CFR 190. Title 40 of the Code of Federal Regulations, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."
40 CFR 192, Title 40 of the Code of Federal Regulations, Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."
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From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:05 PM
To: Rosnick, Andrew
Subject: Reference List

See attached.

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:08 PM
To: Thornton, Marisa
Subject: FW: These are the References with their links, excluding the ones not found

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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 2:40 PM
To: Nesky, Anthony
Subject: RE: These are the References with their links, excluding the ones not found

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From: Nesky, Anthony
Sent: Monday, June 23, 2014 2:38 PM
To: Rosnick, Andrew
Subject: RE: These are the References with their links, excluding the ones not found

Umm…great…thanks…could you send them to me :)
?

Tony Nesky
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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 2:34 PM
To: Nesky, Anthony
Subject: RE: These are the References with their links, excluding the ones not found

CFR References have been added.

From: Nesky, Anthony
Sent: Monday, June 23, 2014 1:56 PM
To: Rosnick, Andrew
Subject: RE: These are the References with their links, excluding the ones not found

Thanks! Please add the CFR references, but make sure that you use the link to the Code of Federal Regulations website only. Thanks!

Tony Nesky
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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 1:12 PM
To: Nesky, Anthony
Subject: These are the References with their links, excluding the ones not found

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From: Nesky, Anthony
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See attached.

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:07 PM
To: Thornton, Marisa
Subject: FW: These are the References with their links, excluding the ones not found

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From: Nesky, Anthony
Sent: Monday, June 23, 2014 2:41 PM
To: Rosnick, Andrew
Subject: RE: These are the References with their links, excluding the ones not found

Much better…thanks!

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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 2:40 PM
To: Nesky, Anthony
Subject: RE: These are the References with their links, excluding the ones not found

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From: Nesky, Anthony
Sent: Monday, June 23, 2014 2:38 PM
To: Rosnick, Andrew
Subject: RE: These are the References with their links, excluding the ones not found

Umm…great…thanks…could you send them to me :)
?

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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 2:34 PM
To: Nesky, Anthony
Subject: RE: These are the References with their links, excluding the ones not found

CFR References have been added.

From: Nesky, Anthony
Sent: Monday, June 23, 2014 1:56 PM
To: Rosnick, Andrew
Subject: RE: These are the References with their links, excluding the ones not found

Thanks! Please add the CFR references, but make sure that you use the link to the Code of Federal Regulations website only. Thanks!

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From: Rosnick, Andrew
Sent: Monday, June 23, 2014 1:12 PM
To: Nesky, Anthony
Subject: These are the References with their links, excluding the ones not found

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40 CFR 190. Title 40 of the Code of Federal Regulations, Part 190, “Environmental Radiation Protection Standards for Nuclear Power Operations.”
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From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:05 PM
To: Rosnick, Andrew
Subject: Reference List

See attached.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:07 PM
To:	Thornton, Marisa
Subject:	FW: March 13 meeting with Ute tribal chair

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:23 PM
To: Rosnick, Reid; Childers, Pat
Subject: RE: March 13 meeting with Ute tribal chair

Pat, in addition to me, the attendees in Region were:
Randy Brown
Art Palomares
Mike Shanahan
Alfreda Mitre
Jasmine Saldenha
Scott Patefield
Corbin Darling

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Rosnick, Reid
Sent: Thursday, June 19, 2014 1:57 PM
To: Childers, Pat
Cc: Diaz, Angelique
Subject: RE: March 13 meeting with Ute tribal chair

Pat

I believe so (all my notes are packed for an impending move). I was there, along with Jonathan Edwards. I don't have Region 8 attendance but I copied Angelique Diaz who may have their attendees.

From: Childers, Pat
Sent: Thursday, June 19, 2014 3:46 PM
To: Rosnick, Reid
Subject: FW: March 13 meeting with Ute tribal chair

Reid

This was the meeting you attended with them correct? I wasn't there did anyone else attended from OAR?

From: Sims, JaniceHQ
Sent: Thursday, June 19, 2014 3:43 PM
To: McInnis, Marissa
Cc: Childers, Pat
Subject: RE: March 13 meeting with Ute tribal chair

Hi Marissa,

Hmmm. There wasn't a sign-in sheet but I've got some notes from the meeting. These are the folks that I have, maybe Pat can help me identify the folks from OAR. Sorry I can't be more helpful.

EPA:
Jane Nishida (OITA/IO)
Karin Koslow (OITA/AIEO)
Janice Sims (OSWER/IO)
Danny Gogal (OECA/OEJ)
Dana Stalcup (OSWER/OSRTI)
Lee Tyner (OGC)

OAR (sorry didn't record names)
Region 8 was on the phone…. I have in my notes a "Chris/Christine" sorry- didn't get a last name though I distinctly remember more than one R8 person on the phone.

Janice Sims, QEP
on detail to
OSWER's Innovation Partnership and Communication Office
Tribal Program Coordinator
1200 Penn Ave, NW 5101 T
Washington, DC 20460
(202) 566-2892

From: McInnis, Marissa
Sent: Thursday, June 19, 2014 11:58 AM
To: Sims, JaniceHQ
Subject: March 13 meeting with Ute tribal chair

Hi Janice!

Great seeing last Friday!

I'm responding to a question from Karin regarding a meeting we had with the Ute Tribal Chair back on March 13th. I have the scheduler with the list of attendees, but do you have an actual list of who was in the room? Scott Clough is asking for it.

Thanks in advance!
~MM

Marissa McInnis
Communications
American Indian Environmental Office
Office of International and Tribal Affairs, U.S. EPA
202-564-2467 mcinnis.marissa@epa.gov
www.epa.gov/tribal

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:07 PM
To: Thornton, Marisa
Subject: FW: Court Reporter Needed?

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:24 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: Court Reporter Needed?

It has come to my attention that a court reporter is needed for the Subpart W public hearing. Let me know what kind of help you need from Region 8 in identifying one. I am told that for previous hearings HQ provided the money and the Region found the reporter.

Thanks,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:07 PM
To: Thornton, Marisa
Subject: FW: Court Reporter Needed?

From: Rosnick, Reid
Sent: Monday, June 23, 2014 6:22 PM
To: Nesky, Anthony
Subject: RE: Court Reporter Needed?

Tony,

Correct me if I'm wrong, but didn't you cost a court reporter in your work assignment request? It really doesn't matter to me, if the Region can get a good deal then we should go with it.

Reid

From: Nesky, Anthony
Sent: Monday, June 23, 2014 3:33 PM
To: Rosnick, Reid
Subject: FW: Court Reporter Needed?

What do you think, Reid? Will it be easier/cheaper to go through the Region, or to use the contractor?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, June 23, 2014 3:24 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: Court Reporter Needed?

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Thanks,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:09 PM
To: Thornton, Marisa
Subject: FW: Reference List
Attachments: References.docx

From: Nesky, Anthony
Sent: Friday, June 20, 2014 3:05 PM
To: Rosnick, Andrew
Subject: Reference List

See attached.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

************************* ATTACHMENT REMOVED *************************

This message contained an attachment which the administrator has caused to be removed.

************************* ATTACHMENT REMOVED *************************

Attachment name: [image001.jpg]
Attachment type: [image/jpeg]

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:09 PM
To:	Thornton, Marisa
Subject:	FW: EPA Call agenda
Attachments:	removed.txt

From: Cristina Gonzalez-Maddux [mailto:Cristina.Gonzalez-Maddux@nau.edu]
Sent: Friday, June 20, 2014 2:06 PM
To: Rosnick, Reid; Andy Bessler
Subject: RE: EPA Call agenda

Thank you very much Reid. Have a wonderful weekend.

- Cristina

Cristina Gonzalez-Maddux
Research Specialist
Institute for Tribal Environmental Professionals
Northern Arizona University
PO Box 15004
Flagstaff, AZ 86001-5768
Phone: (928) 523-8785
Fax: (928) 523-1280

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, June 20, 2014 10:06 AM
To: Andy Bessler
Cc: Cristina Gonzalez-Maddux
Subject: RE: EPA Call agenda

Andy/Cristina,

Attached is my presentation for the call. Please let me know if you have questions or comments. Thanks, and have a great weekend.

Reid

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 20, 2014 12:48 PM
To: Rosnick, Reid
Cc: Cristina Gonzalez-Maddux
Subject: EPA Call agenda

Here is the agenda for the call on the 26th. I am sorry I will not be able to hear your presentation but am thankful that Cristina can fill in as the facilitator.

If you have further questions about the agenda or to finalize plans on your presentation, please contact Cristina who I have cc'ed here.

Cristina's office phone is 928-523-8785.

We look forward to receiving your presentation.

Andy

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

************************ ATTACHMENT REMOVED ************************

This message contained an attachment which the administrator has caused
to be removed.

************************ ATTACHMENT REMOVED ************************

Attachment name: [image001.jpg]
Attachment type: [image/jpeg]

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:09 PM
To: Thornton, Marisa
Subject: FW: EPA Call agenda
Attachments: removed.txt

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 20, 2014 1:08 PM
To: Rosnick, Reid
Cc: Cristina Gonzalez-Maddux
Subject: RE: EPA Call agenda

Great Reid, thanks so much!

Andy

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
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Sent: Friday, June 20, 2014 10:06 AM
To: Andy Bessler
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We look forward to receiving your presentation.

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Andy Bessler
Project Director

NTAA
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P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
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National Tribal Air Association
NTAA- EPA Air Policy Call Agenda
June 26th, 2014

Call In Number: 1-866-299-3188
Conference Code: 9195415624#

Call Time: 10 am AK, 11 am PT, 12 pm MT, 1 pm CT, and 2 pm ET

GotoWebinar page to view documents on the call:
https://attendee.gotowebinar.com/register/3207916791458128641

Call Agenda:

1. **EPA's Proposed Clean Power Plan: Presented by Janet McCabe**, OAR – 30 minutes.

   On June 2, 2014, the EPA proposed the Clean Power Plan that will maintain an affordable, reliable energy system, while cutting pollution and protecting our health and environment. Power plants are the largest source of carbon pollution in the U.S., accounting for roughly one-third of all domestic greenhouse gas emissions. Nationwide, the Clean Power Plan will help cut carbon pollution from the power sector by 30 percent below 2005 levels. EPA's Acting Assistant Administrator Janet McCabe will be on the call to present the Clean Power Plan and answer any questions for those on the call. The draft Clean Power Plan can be found here: http://www2.epa.gov/carbon-pollution-standards.

2. **EPA's Proposed Rule for Radon Emissions from Uranium mills: Presented by Reid Rosnick**, ORIA - Time: 30 minutes.

   On May 2nd, EPA proposed a rule which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings.*" The presentation will review the main points of the proposed rule with time for questions and answers. The draft rule can be found here:

http://www.epa.gov/radiation/docs/neshaps/subpart-w/neshap_subpart-w_npr-final_-prepublication.pdf

3. **EPA Air Updates – (OAR, OAQPS, OTAQ, ORIA, OAP)**

4. **NTAA Updates – Bill Thompson, NTAA Chairman**

The next NTAA/EPA Policy call will be on
July 31st, 2014 at 12:00 Noon Mountain Time

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:10 PM
To:	Thornton, Marisa
Subject:	FW: EPA Call agenda
Attachments:	NTAA EPA Call Agenda, June 26, 2014.docx

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 20, 2014 12:48 PM
To: Rosnick, Reid
Cc: Cristina Gonzalez-Maddux
Subject: EPA Call agenda

Here is the agenda for the call on the 26th. I am sorry I will not be able to hear your presentation but am thankful that Cristina can fill in as the facilitator.

If you have further questions about the agenda or to finalize plans on your presentation, please contact Cristina who I have cc'ed here.

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We look forward to receiving your presentation.

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Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:10 PM
To: Thornton, Marisa
Subject: FW: Request for Public Hearings

From: Thornton, Marisa
Sent: Friday, June 20, 2014 8:38 AM
To: Rosnick, Reid
Subject: RE: Request for Public Hearings

Done - http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html#documents

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From: Rosnick, Reid
Sent: Friday, June 20, 2014 8:33 AM
To: Thornton, Marisa
Subject: RE: Request for Public Hearings

Live I guess

From: Thornton, Marisa
Sent: Friday, June 20, 2014 8:32 AM
To: Rosnick, Reid
Subject: RE: Request for Public Hearings

Ok….you want to upload the page to the staging server or live server?

From: Rosnick, Reid
Sent: Friday, June 20, 2014 7:31 AM
To: Thornton, Marisa
Cc: Miller, Beth
Subject: RE: Request for Public Hearings

Hi Marisa,

Yes, please put the letter and pdf go in the documents section for now, and we'll sort it all out in the next week or so. Actually we may sort it out after the conference call.

Reid

From: Thornton, Marisa
Sent: Friday, June 20, 2014 7:04 AM
To: Rosnick, Reid
Cc: Miller, Beth
Subject: RE: Request for Public Hearings

Reid,

Should the letter and pdf go under the document section or someone else?

Marisa
301-367-7778

From: Rosnick, Reid
Sent: Thursday, June 19, 2014 4:57 PM
To: Thornton, Marisa; Miller, Beth
Cc: Stahle, Susan; Peake, Tom
Subject: FW: Request for Public Hearings

Beth/Marisa,

Will you please place the pdf in the Subpart W docket and the email with pdf on the Subpart W website? Thanks

Reid

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Thursday, June 19, 2014 4:49 PM
To: Rosnick, Reid; Nesky, Anthony
Subject: Request for Public Hearings

Dear Mr. Rosnick and Mr. Nesky,

I have attached a letter to EPA on behalf of 13 organizations requesting hearings in the Subpart W Rulemaking, Docket ID No. EPA-HQ-OAR-2008-0218.

We appreciate in advance for your consideration and look forward to your response. Please contact me if you have any questions or would like additional information.

Thank you,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:10 PM
To: Thornton, Marisa
Subject: FW: Feedback on hearing registration website; planning of new Task Order for September

---

From: Nesky, Anthony
Sent: Friday, June 20, 2014 11:40 AM
To: Apostolico, Mary
Cc: Kent, Rebecca; Miller, Beth; Herrenbruck, Glenna; Rosnick, Reid
Subject: Feedback on hearing registration website; planning of new Task Order for September

Dear Mary:

Congratulations on your new contract! I am looking forward to working with SRA this September. I'd like to get the ball rolling on a new Task Order for the September hearings. Could you please give me a call at your earliest convenience to discuss scope?

Here is some feedback on the registration website:

- Description: Please change the first sentence to read: "National Emission Standards for Radon Emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61 sets limits on radon emissions from tailings at operating uranium mills.
- Dates and capacity. The hearing dates are now 9/3/14 and 9/4/14. The 9/3 reservation holds 100 and the 9/4 holds 60 people.
- Contact: Would it be possible to make me the contact person for the hearing?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:10 PM
To: Thornton, Marisa
Subject: FW: Automatic reply: Save the Date: Subpart W Public Hearing

---

From: Sutin, Elyana
Sent: Friday, June 20, 2014 11:40 AM
To: Diaz, Angelique
Subject: Automatic reply: Save the Date: Subpart W Public Hearing

I am currently out of the office. I will respond to you message when I return. If you need immediate assistance please contact Tina Artemis at 303.312.6865.

**Clean Water Alliance • Colorado Citizens Against ToxicWaste, Inc.
Defenders of the Black Hills • EARTHWORKS • High Country
Conservation Advocates • Information Network for Responsible Mining
Multicultural Alliance for a Safe Environment • Nuclear Information
and Resource Service • Sierra Club Nuclear Free Campaign
Tallahassee Area Community, Inc. • Uranium Watch
Western Colorado Congress • Western Nebraska Resources Council**

June 19, 2014

Reid J. Rosnick and Tony Nesky
Office of Radiation and Indoor Air, Mail Code 6608
Radiation Protection Division
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue N.W.
Washington, D.C., 20460

Via email to rosnick.reid@epa.gov, nesky.tony@epa.gov

Re: Request for Public Hearings, Docket ID No. EPA-HQ-OAR-2008-0218

Dear Mr. Rosnick and Mr. Nesky,

We would like to express our appreciation to the Environmental Protection Agency for initiating the Rulemaking for Revisions to the National Emission Standards for Radon Emissions from Operating Mill Tailings, known as NESHAPs Subpart W. This process can provide an excellent opportunity for public involvement and citizen-driven decision-making. The members and supporters of our organizations share a collective interest in ensuring that the new Subpart W rule provides the highest level of protective measures for human health and the environment and that an appropriate regulation is developed to limit radiation emissions from uranium recovery facilities across the United States.

As such, members of our organizations are eager to attend and participate in public hearings and respectfully request that EPA hold multiple proceedings in affected communities in order to enable a more robust and participatory decision-making process. Due to the lengthy travel distances in the West, holding hearings in multiple locations is warranted because the new rule will have bearing on facilities in each respective region. EPA is also obligated to consider Environmental Justice issues in the development of the new Subpart W rule. Many of the affected communities near uranium recovery facilities include residents who are members of indigenous groups, whose interests must be considered and whose interests must be addressed. In all communities affected by uranium recovery facilities, Environmental Justice issues are also linked to economic disparities, which must be carefully weighed and considered. Having multiple hearings will increase the ability of affected community members to participate directly in the public review process and address these issues.

Therefore, we request that EPA hold hearings in the following locations during the public comment period:

- White Mesa, Utah
- Cañon City, Colorado
- Gallup, New Mexico
- Rapid City, South Dakota

The community of White Mesa, Utah, is home to the only operating conventional uranium mill in the nation and is currently subject to Subpart W regulation. The operation of the mill and its history of noncompliance with EPA and State of Utah regulations, including Subpart W, have been controversial and have resulted in litigation against the operator that addresses the violation of Subpart W requirements and the operations of the subject tailing ponds. Nearby residents have experienced the impacts of offsite contamination and radioactive releases from the White Mesa Mill, as documented in a peer-reviewed study issued by the U.S. Geological Survey in 2011. The future Piñon Ridge Mill in Colorado is also within reachable distance of White Mesa. Members of the public expressed great dissatisfaction with the Subpart W permitting of this mill, which largely exempted monitoring requirements to help prevent radioactive releases. It is essential for EPA to conduct a hearing in White Mesa and take input from people who live in the region.

Residents of Cañon City, Colorado, and the surrounding region have an interest in ongoing EPA oversight of the Cotter Corporation mill at Lincoln Park, which is currently undergoing final closure but is subject to Subpart W compliance because of the continuing deposition of material into regulated tailings ponds. Community members are directly affected by the mill's history of radioactive releases and years-long issues with the implementation of monitoring required under Subpart W. In addition, surrounding areas are also affected by future uranium recovery proposals that involve developing technologies that are likely to be classified for regulation requiring NRC licensing and EPA oversight for Subpart W implementation.

Gallup, New Mexico, is the city nearest to the first proposed in-situ recovery uranium mine in New Mexico. Gallup is a central location, accessible for multiple communities on Navajo Nation and the Pueblos of Acoma, Laguna and Zuni, which are affected by the possibility of future regulated facilities in Northwestern New Mexico and on Mount Taylor. Existing reclamation and closure projects near Milan and Churchrock operate evaporation ponds that emit radon into surrounding communities. There are proposals for conventional uranium mining and processing facilities around Mount Taylor. Affected communities in the region have a direct interest in implementation of

Subpart W due to its implications for radon releases from: 1) in-situ recovery mining, and 2) two evaporation ponds that are currently in place on top of the Churchrock uranium mill tailings pile. Residents throughout the region are also concerned about the impacts to tribal lands, jurisdictions and traditional use areas, most notably the state-designated Mt. Taylor Traditional Cultural Property as it pertains to Subpart W. A public hearing in Gallup will help EPA to take direct input from affected residents in the interest of fully addressing Environmental Justice concerns as part of the Subpart W rulemaking process.

Rapid City, South Dakota, is a central location to take input from members of the public affected by the proposed Dewy-Burdock in-situ mine, sited on traditional lands of the Oglala Sioux Tribe, which has raised significant issues about the impacts of radiation releases and contamination of important cultural areas. Members of the public who are affected by the Crow Butte facility in Chadron, Nebraska — which has a lengthy history of radioactive releases — as well as by uranium recovery facilities in northeast Wyoming will also receive the benefit of participation in a hearing in a regional location. Residents in the region are affected by the increasing number of proposals and expansions planned for in-situ recovery facilities in the Northern Plains and would enjoy an increased opportunity to participate through a hearing in Rapid City.

Thank you for considering our request to hold multiple hearings in affected communities for the Subpart W Rulemaking. If you have any questions regarding this correspondence, please do not hesitate to contact any of our organizations.

Sincerely,

Sharyn Cunningham
Colorado Citizens Against ToxicWaste, Inc.
P.O. Box 964, Cañon City, CO 81215
sharyn@bresnan.net
(719) 275-3432

Charmaine White Face
Defenders of the Black Hills
P.O. Box 2003, Rapid City, S.D. 57709
bhdefenders@msn.com

Aaron Mintzes
Earthworks
1612 K St., NW, Suite 808, Washington, DC, 20006
amintzes@earthworksaction.org
(202) 887-1872

Allison N. Melton
High Country Conservation Advocates
P.O. Box 1066, Crested Butte, CO 81224

(970) 349-7104
alli@hccaonline.org

Jennifer Thurston
Information Network for Responsible Mining
P.O. Box 27, Norwood, CO 81423
jennifer@informcolorado.org
(970) 497-4482

Susan Gordon
Multicultural Alliance for a Safe Environment
P.O. Box 4524, Albuquerque, N.M. 87196
susangordon@earthlink.net
(505) 577-8438

Diane D'Arrigo
Nuclear Information and Resource Service
6930 Carroll Avenue Suite 340, Takoma Park, MD 20912
dianed@nirs.org
(301) 270-6477
www.nirs.org

Susan Corbett
Sierra Club Nuclear Free Campaign
85 Second Street, 2nd Floor, San Francisco, CA 94105
jscorbett@mindspring.com

Cathe Meyrick
Tallahassee Area Community, Inc.
P.O. Box 343, Cañon City, CO 81215
(719)-275-1030
taccolorado.com

Sarah M. Fields
Uranium Watch
P.O. Box 344, Moab, UT 84532
sarah@uraniumwatch.org
(435) 260-8384

Rein van West
Western Colorado Congress
134 N. 6th Street, Grand Junction, CO 80521
emily@wccongress.org
(970) 256-7650

Buffalo Bruce
Western Nebraska Resources Council
P.O. Box 612, Chadron, NE 69337
Buffalobruce1@gmail.com
(308) 432-3458

Clean Water Alliance
P.O. Box 591
Rapid City, S.D. 57709
www.bhcleanwateralliance.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:10 PM
To: Thornton, Marisa
Subject: FW: Request for Public Hearings
Attachments: SubpartW-Hearing-Request.pdf; ATT00001.htm

From: Jennifer Thurston [mailto:jennifer@informcolorado.org]
Sent: Thursday, June 19, 2014 4:49 PM
To: Rosnick, Reid; Nesky, Anthony
Subject: Request for Public Hearings

Dear Mr. Rosnick and Mr. Nesky,

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We appreciate in advance for your consideration and look forward to your response. Please contact me if you have any questions or would like additional information.

Thank you,

Jennifer Thurston
Information Network for Responsible Mining
Cell: 212-473-7717
Email: jennifer@informcolorado.org
Web: www.informcolorado.org
Twitter: https://twitter.com/INFORMining

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:10 PM
To: Thornton, Marisa
Subject: FW: March 13 meeting with Ute tribal chair

From: Childers, Pat
Sent: Thursday, June 19, 2014 3:46 PM
To: Rosnick, Reid
Subject: FW: March 13 meeting with Ute tribal chair

Reid

This was the meeting you attended with them correct? I wasn't there did anyone else attended from OAR?

From: Sims, JaniceHQ
Sent: Thursday, June 19, 2014 3:43 PM
To: McInnis, Marissa
Cc: Childers, Pat
Subject: RE: March 13 meeting with Ute tribal chair

Hi Marissa,

Hmmm. There wasn't a sign-in sheet but I've got some notes from the meeting. These are the folks that I have, maybe Pat can help me identify the folks from OAR. Sorry I can't be more helpful.

EPA:
Jane Nishida (OITA/IO)
Karin Koslow (OITA/AIEO)
Janice Sims (OSWER/IO)
Danny Gogal (OECA/OEJ)
Dana Stalcup (OSWER/OSRTI)
Lee Tyner (OGC)

OAR (sorry didn't record names)
Region 8 was on the phone…. I have in my notes a "Chris/Christine" sorry- didn't get a last name though I distinctly remember more than one R8 person on the phone.

Janice Sims, QEP
on detail to
OSWER's Innovation Partnership and Communication Office
Tribal Program Coordinator
1200 Penn Ave, NW 5101 T
Washington, DC 20460

(202) 566-2892

From: McInnis, Marissa
Sent: Thursday, June 19, 2014 11:58 AM
To: Sims, JaniceHQ
Subject: March 13 meeting with Ute tribal chair

Hi Janice!

Great seeing last Friday!

I'm responding to a question from Karin regarding a meeting we had with the Ute Tribal Chair back on March 13th. I have the scheduler with the list of attendees, but do you have an actual list of who was in the room? Scott Clough is asking for it.

Thanks in advance!
~MM

Marissa McInnis
Communications
American Indian Environmental Office
Office of International and Tribal Affairs, U.S. EPA
202-564-2467 mcinnis.marissa@epa.gov
www.epa.gov/tribal

UTE MOUNTAIN UTE TRIBE'S INITIAL QUESTIONS
Environmental Protection Agency, Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings, Proposed Rule
40 C.F.R. Part 61
Submitted on June 13, 2014 in preparation for government-to-government consultation, July 10, 2014

I. EPA, INDIAN TRIBES, AND EXECUTIVE ORDER 13175

1. The Environmental Protection Agency's (EPA) statement regarding compliance with Executive Order 13175 states that the Subpart W rulemaking action does not have "tribal implications" because the rulemaking does not impose regulatory requirements on tribal governments. Please be prepared to discuss how the following issues impact the EPA's Executive Order 13175 analysis:

   - Although Native Americans make up only 1.4 percent of Utah's racial profile (and 0.9 percent of the United States' racial profile), they make up 55.8 percent of the racial profile for San Juan County, Utah (the county where the White Mesa Mill (WMM) is located).
   - The WMM facility is located on aboriginal lands of the Ute Mountain Ute Tribe.
   - The WMM facility is located adjacent to land and other Indian Trust Assets held in trust by the United States on behalf of the Ute Mountain Ute Tribe (and less than 3 miles from the nearest Tribal resident).
   - The Tribal community located in White Mesa is downgradient of the WMM facility.
   - The Tribal community located in White Mesa is completely dependent on groundwater supplies located underneath the WMM facility and tailings cells.
   - Activities and operations at the WMM have already impacted Tribal members' abilities to use surface, plant, wildlife, and surface water resources on public and Tribal lands.

2. Please be prepared to discuss how the EPA will address Tribal concerns during this Subpart W rulemaking and related rulemaking processes (including, but not limited to, the anticipated revision to 40 C.F.R. Part 192).

3. Please be prepared to discuss how or whether the EPA undertook analysis of how this rulemaking will impact UMU Tribal members, UMU Tribal lands, and Indian Trust Assets.

II. NESHAPS/CLEAN AIR ACT QUESTIONS

4. Has the EPA evaluated establishing a lesser quantity or different criteria for major sources of radionuclides under Section 112(a)(1) of the CAA? *See* footnote 2, page 25390 of the proposed rulemaking (noting that *none* of the uranium recovery facilities are major sources under NESHAPS).

5. On page 25390 of the proposed rulemaking, the EPA identifies the "source category" for Subpart W using 40 C.F.R. § 61.250 and the proposed definition of "uranium recovery facility." Has the EPA listed uranium recovery facilities as a category or subcategory of sources under Section 112(c) of the Clean Air Act? If so, please provide an explanation and documentation in advance of the consultation meeting.

6. On page 25390 of the proposed rulemaking, the EPA states, "Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings." However, the proposed Subpart W rulemaking only covers some HAP sources at uranium recovery facilities, and not others (such as stackhouses, ore pad, ore grinder, and the Mill yard, see Question 7, *infra*). Please explain the EPA's rationale for excluding such HAP sources at conventional uranium mills.

7. On page 25390 of the proposed rulemaking, the EPA states: "We presently have no data or information that shows any other HAPs being emitted from these impoundments." Please provide a response to the following initial questions, data, and information regarding other HAPs that may be emitted from the WMM.

    - The WMM's 10 C.F.R. § 40.65 environmental airborne particulate monitoring program monitors for natural uranium (Uranium-238, Uranium-234, Uranium-235), Thorium-230, Radium-226, and Lead-210. This air monitoring program has detected all four isotopes at all of the air monitoring stations. Additionally, the WMM has identified Lead-210, Thorium-230, Thorium-232, Polonium-210, Radium-226, and Radium-228 in wastewater samples from the tailings impoundments. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
    - The WMM processes uranium ore. During the uranium storage and milling processes, there may be more than three dozen radioactive isotopes present at the WMM facility (including actinium, astatine, bismuth, francium, lead, polonium, protactinium, radium, radon, thallium, thorium, and uranium). *See* Uranium Decay Series diagram on page 44 of the Technical and Regulatory Support document. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
    - The WMM's uranium milling process uses significant quantities of chemicals (sodium chlorate is used during ore oxidation; sulfuric acid and flocculants are used during the leaching and clarification; secondary amines/kerosene, tri-alkyl amines/tributyl phosphate modifier, and quaternary ammonium compounds/alcohol are used during the solvent extraction; chlorides and sulfates are used during pregnant liquor stripping; and ammonia hydroxide and sodium hydroxide during yellowcake precipitation). During the storage and use of these chemicals, and after these chemicals are disposed in the tailings impoundments, there may be significant emissions of HAPs at the WMM.

- The WMM processes alternate feed materials. During the alternate feed storage and milling processes, other radioactive isotopes, non-metal compounds, and other regulated HAPs may be emitted from the WMM.
- The WMM processes vanadium ore. Vanadium is considered to be dangerous to life and health by both the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health, and may be listed as a HAP in the future. The WMM's vanadium recovery process uses a significant quantity of chemicals (sodium chlorate is used during the redox/pH adjustment; kerosene and secondary amines are used during the solvent extraction; soda ash is used during the vanadium pregnant liquor stripping process; and ammonia hydroxide is used during the vanadium precipitation). This indicates that the vanadium recovery process results in the emission of HAPs other than Radon-222 from the WMM facility.

8. On page 25390 of the proposed rulemaking, the EPA states that it evaluated the MACT standards applicable to major sources in the same industrial sector. Please provide the Tribe with this analysis prior to the consultation, and be prepared to explain the MACT analysis that the EPA performed during this rulemaking process.

9. Please explain how the EPA evaluated the use of a work practice standard, rather than an emissions standard, for the control of a HAP under the proposed rulemaking. *See* Section 112(h), Clean Air Act. Please specifically address the EPA's determination to remove the current emissions standard for existing impoundments. Please also explain how removing the emissions standard from Subpart W will affect: (a) how the WMM facility sets and meets the ALARA goal to protect worker and adjacent communities from radionuclides; and (b) monitoring of radon emissions under 10 C.F.R. Part 40, Appendix A.

III. SUBPART W AND CLOSURE OF LEGACY IMPOUNDMENTS

10. In 1989, when the EPA proposed the current Subpart W NESHAP, the EPA concluded that, "Existing mill tailing piles are large piles of waste that emit radon. There is nothing that can be done to reduce the amount of radon they emit except cover them." 54 FR 9644 (March 7, 1989). EPA crafted Subpart W to prohibit uranium mills from having more than two tailings impoundments in operation. Explain why the EPA has not required closure of the legacy Tailings Cells 1, 2, and 3 at the WMM, as contemplated and required by the current NESHAP.

11. In this proposed rulemaking, the EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Explain how the EPA can justify the long-term risk of having almost 300 acres of tailings impoundments that are either in operation or in closure but without a permanent radon barrier at the WMM. *See also* questions on conventional and non-conventional impoundments.

IV. DEFICIENT OR INCORRECT ANALYSIS OF OPERATIONS AND FACILITIES AT THE WMM

12. The owners of the WMM state in the June 1, 2009 letter response to EPA's CAA Section 114 Information Request that Tailings Cells 1, 2, and 3 meet the requirements of 40 C.F.R. 192.32(a). The WMM owners specify that these specific Tailings Cells meet the design and operating requirements under 40 C.F.R. 264.221(a). Please explain how the EPA evaluated the WMM owners' assertions regarding compliance with 40 C.F.R. 192.32(a) and 40 C.F.R. 264.221(a), given the following:
    - The liners in Tailings Cells 1, 2, and 3 were designed for a 15-year life and were installed between May 1980 and September 1982. These impoundments have already been in operation for over 30 years.
    - Contamination of the shallow groundwater underlying Tailings Cells 1, 2, and 3 has been documented and is the subject of investigation and corrective action to address elevated chloroform, nitrate and chlorides. There is significant evidence that the liners on Tailings Cells 1, 2, and 3 have already allowed migration of waste out of the impoundments into the adjacent groundwater.
    - The Agreement State and the WMM owners treat the shallow groundwater aquifer under the WMM facility as the leak detection system for Tailings Cells 1, 2, and 3 (and developed a groundwater monitoring program that can detect tailings cell leakage only after waste has migrated out of these legacy impoundments).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 do not have appropriate chemical properties and sufficient strength and thickness to prevent failure due to conditions outlined in 40 C.F.R. § 264.221(a)(1).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 are not compatible with alternate feed materials contained in the impoundments.

13. Several important sections of the proposed rulemaking rely on the provisions of 40 C.F.R. § 264.221(c) (and not 40 C.F.R. § 264.221(a)) to explain protection of groundwater or other environmental analysis. *See, e.g.*, page 25393 (setting forth specific liner requirements from 40 C.F.R. § 264.221(c)); page 25397 (specifically relying on safeguards from a leak detection system); page 25401 (specifying that the proposed GACT is for double liners on non-conventional impoundments). The provisions of 40 C.F.R. § 264.221(c) are significantly more protective of groundwater, human health, and the environment.

    - Is the EPA taking the position that all conventional impoundments and non-conventional impoundments must meet the requirements of 40 C.F.R. § 264.221(c)? If so, please clarify the EPA's position on whether Tailings Cells 1, 2, and 3 at the WMM meet the requirements of 40 C.F.R. § 264.221(c).

    - If the EPA is <u>not</u> taking the position that 40 C.F.R § 264.221(c) applies to all conventional and non-conventional impoundments, please explain how the EPA addressed risks to groundwater from legacy impoundments like Tailings Cells 1,

2, and 3. Please specifically address how the EPA assessed the risk of groundwater contamination from Tailings Cell 1. *See* question 12, *supra*.

14. Please explain how (or if) the EPA's specific analysis of the WMM facility addressed the following:

- Cell 2 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
- Method 115 monitoring on Cell 2 detected a Subpart W NESHAPS violation in 2012/2013 over the 20 pCi/m2-s limit.
- Cell 3 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
- Cell 3 is currently the only tailings cell at the WMM that receives certain forms of 11(e)(2) byproduct material (materials trucked in, including ISL waste).
- The WMM facility has not historically operated its "conventional" and "non-conventional" tailings impoundments separately. Tailings Cell 4A was operated as a "non-conventional" impoundment, which resulted in surface and groundwater contamination until the cell was retrofitted starting in 2008. Tailings Cell 4B is currently operated as a "non-conventional" impoundment, but the WMM owners indicate that it will be used as a "conventional" impoundment in the future.
- Under currently approved and proposed reclamation plans for the WMM, the permanent radon barriers will not be placed on *any* tailings impoundments until final reclamation at the facility.

V. NON-CONVENTIONAL IMPOUNDMENTS

15. How did the EPA develop the proposed definition of "non-conventional impoundments"?

16. Please explain how the EPA will distinguish between conventional and non-conventional impoundments.

    a. Is there a minimum amount of liquid that must be present in the pond for the EPA to classify a tailings impoundment as a non-conventional impoundment, or can a facility owner convert a conventional impoundment into a non-conventional impoundment by adding the minimum 1m of liquid on the top of the impoundment?

    b. Will the final reclamation or removal plan for a tailings impoundment determine whether it qualifies as a "non-conventional impoundment"?

        - Please explain how the EPA will treat Tailings Cell 1 at the WMM (noting that the WMM owners plan to remove solids from the cell upon final reclamation, but then permanently dispose of debris from the Mill facilities and contaminated soil in the cell). *See* June 1, 2009 Response Letter at 6; page 25405 of the proposed rulemaking (addressing the disposal of byproduct material like deconstruction material during facility reclamation).

- Please explain how the EPA will treat Tailings Cell 4B at the WMM (which the WMM owner is currently operating as a non-conventional impoundment, but which will become a conventional impoundment before final reclamation).

17. The WMM is currently authorized to temporarily place liquid 11(e)(2) byproduct material in “Roberts Pond” (before pumping the liquid into Tailings Cells 1 and 4B). Does Roberts Pond meet the proposed definition of a “non-conventional impoundment”? *See* pages 25390, 25393 of the proposed rulemaking (addressing “holding” and “collection” ponds). Please explain how EPA has assessed the Radon-222 emissions from Roberts Pond and from the regular transfer of process water from Roberts Pond to Tailings Cells 1 and 4B.

18. Please explain the EPA’s rationale for allowing non-conventional impoundments to exist until removal at facility closure.

    - Did the EPA analyze whether allowing water-covered impoundments to exist for the life of a facility increases risks of groundwater and surface water contamination? Please see question 12 (and explain EPA’s position on the 15-year design life for Tailings Cell 1 at the WMM).
    - How will the EPA ensure that non-conventional impoundments are periodically retrofitted to ensure that the impoundments do not contaminate groundwater and surface water?

19. EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Please explain why this linear relationship does not also justify size restrictions on non-conventional impoundments (and please specifically address how this linear relationship will impact Radon-222 emissions when large non-conventional impoundments are dewatered and closed).

20. How has the EPA analyzed what risks non-conventional impoundments (including large non-conventional impoundments like Tailings Cell 1 at the WMM) will pose to human health and the environment when they are de-watered and decommissioned?

21. How will the proposed rule address tailings impoundments that are used as conventional and non-conventional impoundments (such as Tailings Cells 4A and 4B at the WMM)? How will the EPA “count” these cells using the 2-cell limit in the conventional impoundment work practice standard?

22. The EPA’s analysis that using liquids to cover tailings cells “has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero” is insufficient to demonstrate that Tailings Cell 1 at the WMM has a radon flux of “almost zero” (or even under 20 pCi/m2-s).

Based on the information and questions below, please provide the EPA's specific analysis of the calculated radon emissions from Tailings Cell 1, Tailings Cell 4B, and Roberts Pond at the WMM. Please then explain how EPA calculates the dose to the White Mesa Tribal community (considering radon emissions from Tailings Cell 1 and 4B and Roberts Pond, along with radon emissions from "conventional" impoundments 2, 3, and 4A).

a. The proposed rulemaking recognizes that covering tailings impoundments with water does not reduce radon emissions to zero. *See, e.g.*, Radon Emission from Evaporation Ponds (noting that the radon flux above some evaporation ponds can be significant/exceed 20 pCi/m2-s).
b. The proposed rulemaking contemplates the use of radium-laden "process water" to provide liquid covers on non-conventional impoundments, but does not address whether the use of radium-laden process water increases the radon emissions from a non-conventional impoundment. The EPA analysis justifying the use of the 1 meter water cover relies on the assumption that the water cover is not laden with radium. The EPA analysis also calculates significant radon flux from non-conventional impoundments containing radium-laden water. Please justify the EPA's position that 1 m of radium-laden process water can decrease radon flux from tailings impoundments like Tailings Cell 1 at WMM to zero.
c. The EPA's analysis of radon emissions from liquid-covered impoundments recognizes that there are significant radon emissions during the transfer of radium-laden waters to and between tailings impoundments and during enhanced evaporation sprays, but it does not calculate or address these emissions for conventional mills like the WMM.
d. Using the radon flux equation contained in Section 4.0 of the Radon Emissions from Evaporation Ponds report along with the actual radium content[1] in Tailings Cell 1, the Tribe's initial calculation on the radon flux from Tailings Cell 1 is 327 pCi/m2-s (not including emissions during transfer into Cell 1 or during enhanced evaporation sprays).

VI. CONVENTIONAL IMPOUNDMENTS

23. The Tribe is generally confused about the EPA's approach to Tailings Cells 2 and 3 at the WMM. The EPA seems to recognize that neither of these tailings cells meets the work practice standards proposed in this rulemaking. *See* page 25395 of the proposed rulemaking (noting that Cell 3 could not meet the work practice standards). Given that both tailings impoundments are still licensed by the Agreement State to receive liquid and solid 11(e)(2) byproduct material and that neither tailings impoundment has a tailings closure plan with milestones for placement of a permanent radon barrier, please explain how the EPA can continue to justify removing the monitoring requirements and emissions limits that currently apply to these impoundments.

[1] To determine the actual radium content, the Tribe used the 32,700 pCi/L Gross Radium Alpha concentration provided in the in the 2013 Annual Tailings Report.

24. The Tribe is concerned that, although Tailings Cell 2 had a recent violation of the 20 pCi/m2-s emissions limit that applies to existing impoundments (and although that violation was detected during monitoring conducted under Method 115), the EPA did not consider Cell 2 when considering how the proposed rulemaking would impact the WMM. Please explain why the EPA omitted any analysis of Cell 2 and the recent Subpart W violation at Cell 2. Please also explain how the EPA will ensure that emissions from Tailings Cell 2 do not exceed 20 pCi/m2-s between now and when the final radon barrier is placed during final reclamation of the entire facility (given that the EPA is proposing to eliminate both the emissions limit and the monitoring to detect Radon-222 emissions over 20 pCi/m2-s).

25. The proposed rulemaking references the use of an "interim cover" on Tailings Cells 2 and 3 at the WMM. The Tribe is concerned that the WMM owners have used this "interim cover" on Tailings Cell 2 for more than a decade (and that the use of this cover has already resulted in Radon-222 emissions of over the 20 pCi/m2-s limit) and that the Reclamation Plan for the WMM contemplates the use of such "interim covers" until final reclamation at the facility. Please explain whether and how the EPA justifies the use of interim covers (and not the immediate placement of permanent radon barriers).

VII. APPLICABILITY OF 40 C.F.R. PART 192

26. A significant portion of the EPA's analysis in the proposed rulemaking (including analysis on impacts to the environment and human health, analysis on weather and other hazards, and economic analysis) rests on the assumption that all tailings impoundments (conventional and non-conventional) meet the standards set forth in 40 C.F.R. § 192.32(a)(1) and 40 C.F.R. § 264.221. How will the EPA ensure that all the tailings impoundments at the WMM facility meet the applicable federal standards?

27. The EPA is proposing to eliminate internal cross references to the sections of 40 C.F.R. Part 192 that cover placement of permanent radon barriers on tailings impoundments. Additionally, although the EPA identified the need to better define "closure" under Subpart W, the revisions to the terms "standby" and "operation" in the proposed rulemaking do not define or address "closure" under the revised Subpart W NESHAP regulations.
    - How will the EPA determine whether a tailings impoundment has entered "final closure" for Subpart W NESHAP purposes?
    - If the EPA no longer intends to utilize other portions of 40 C.F.R. Part 192 (including, but not limited to, the definitions of "Tailings Closure Plan," "Permanent Radon Barrier," and requirements that the permanent radon barrier be constructed as expeditiously as possible and in accordance with a tailings closure plan), how will the EPA ensure that permanent radon barriers are properly placed on tailings cells? Here, please address the Tribe's concern that, under current reclamation plans for the WMM, the permanent radon barriers for Cells 2 and 3 will not be placed under final reclamation of the facility (and that there are no Tailings Closure Plans, as defined in 40 C.F.R. Part 192, with milestones for the expeditious placement of the permanent radon barriers).

28. The Tribe is concerned that the Tribal community in White Mesa will be exposed to elevated levels of Radon-222 when the WMM facility undertakes de-watering or other closure activities or allows Tailings Cells 2 and 3 to remain open under an "interim cover." Please explain how the EPA has specifically assessed the anticipated dose to the White Mesa Community *during* the closure period. Please also explain how the EPA will ensure that Tribal members, Tribal lands and other Indian Trust Assets are not exposed to Radon-222 emissions in excess of 20 pCi/m2-s during the closure period.

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:11 PM
To:	Thornton, Marisa
Subject:	FW: Ute Mtn Ute tribal consultation on July 10th
Attachments:	NESHAPS Questions for EPA FINAL.pdf

From: Childers, Pat
Sent: Thursday, June 19, 2014 1:14 PM
To: Sims, JaniceHQ
Cc: Rosnick, Reid
Subject: RE: Ute Mtn Ute tribal consultation on July 10th

Hey Janice,

Here are the questions we received. Our office will be on the phone with the RA being there in person.

I am including Reid Rosnick, who is the programmatic lead o the meeting.

Pat

From: Sims, JaniceHQ
Sent: Thursday, June 12, 2014 2:58 PM
To: Childers, Pat
Subject: Ute Mtn Ute tribal consultation on July 10th

Hi Pat,

As you know (because you mentioned in one of your updates at a recent TPM meeting) that EPA is consulting with Ute Mountain Ute (UMU) on NESHAP Subpart W mainly because of the proposed changes to the national emission standard for Radon emissions for operating a uranium mill tailings. Scott Clow, UMU Environmental Director was at the most recent NTC meeting and reminded me of discussions that his Tribal Chair (Scott was there too) had with EPA HQ (OAR and OSWER/OSRTI-superfund) on March 11, 2014 concerning NESHAP and the White Mesa Uranium Mill Site (CERCLA off-site rule). The tribe has some specific questions regarding the Off-Site Rule and wanted EPA to follow-up. Scott indicated in a conversation with me after one of the NTC meetings that the July 10th consultation that is focused on NESHAP Subpart W could expand into a larger conversation with EPA to include the Off-Site Rule. The off-site rule is coordinated by two offices in OSWER (ORCR- RCRA and OSRTI- Superfund). The Superfund program is working with the RCRA program to put together an email to the Superfund DD in R8 to give him a heads up that this issue may present itself during the NESHAP consultation. This is just an FYI for you.

We understand the tribe will have consultation with the Region 10 RA on July 10th. I don't know whether or not HQ OAR will be participating. Do you know who is planning to participate from EPA?

Please let me know if you have questions.

Thanks,
Janice

Janice Sims, QEP
on detail to
OSWER's Innovation Partnership and Communication Office
Tribal Program Coordinator
1200 Penn Ave, NW 5101 T
Washington, DC 20460
(202) 566-2892

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:11 PM
To: Thornton, Marisa
Subject: FW: Ute Mt Ute Consultation

-----Original Appointment-----
From: Peake, Tom
Sent: Thursday, June 19, 2014 10:57 AM
To: Rosnick, Reid
Subject: Accepted: Ute Mt Ute Consultation
When: Thursday, July 10, 2014 11:00 AM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: TBD

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:11 PM
To: Thornton, Marisa
Subject: FW: UMUT, Extension Request Letter
Attachments: Extension Request Letter 2014.pdf

From: Celene Hawkins [mailto:chawkins@utemountain.org]
Sent: Thursday, June 19, 2014 10:49 AM
To: Rosnick, Reid
Cc: sclow@utemountain.org; H. Michael Keller
Subject: UMUT, Extension Request Letter

Dear Reid,

Please see the attached extension request letter, which is going out in hard copy from our offices today. We look forward to talking with you next week.

Best,

Celene Hawkins
Associate General Counsel
Ute Mountain Ute Tribe

Ute Mountain Ute Tribe
Office of the Chairman

Mr. Manuel Heart
P.O. Box JJ
Towaoc, CO 81334

June 16, 2014

Ms. Gina McCarthy
Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

RE: Request for Extension of the Public Comment Period for the Subpart W NESHAP Rulemaking (to Accommodate Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe).

Dear Administrator McCarthy:

On April 14, 2014, I sent you a letter requesting government-to-government consultation between the Environmental Protection Agency (EPA) and the Ute Mountain Ute Tribe (Tribe) on the proposed 40 C.F.R. Part 61 Revisions to National Emissions Standards for Radon Emissions from Operating Mill Tailings (Subpart W NESHAP) rulemaking. *See* Attachment 1. The EPA did not respond to this consultation request before publishing the proposed Subpart W NESHAP rulemaking in the Federal Register and setting July 31, 2014 as the final date for submitting public comments on the proposed rulemaking. Staff from the EPA have now agreed to hold a government-to-government consultation meeting with the Tribe on July 10, 2014, and Tribal staff has diligently prepared staff-to-staff questions to facilitate specific and substantive discussions on the proposed rulemaking. *See* Attachment 2.

I am writing today to request that you extend the public comment period on the Subpart W NESHAP rulemaking for an additional 90 days. This request is based on the complexity of issues contained in the proposed rulemaking and Attachment 2, the extensive nature of the underlying technical support documents, and the specific complexity of evaluating a revision of a NESHAP rule that was adopted prior to the 1990 Clean Air Act Amendments. This request is also based on a specific request that you allow the Tribe a reasonable time period after the initial

July 10, 2014 government-to-government consultation meeting to perform follow-up research, hold additional consultation meetings, and submit official public comments.

Please contact Scott Clow, Environmental Programs Department Director, at (970) 564-5432 or sclow@utemountain.org or Celene Hawkins, Associate General Counsel, at (970) 564-5642 or chawkins@utemountain.org with any questions about this extension request.

Sincerely,

Manuel Heart

Manuel Heart
Chairman
Ute Mountain Ute Tribe

Cc: Tribal Council
Peter Ortego, General Counsel, Ute Mountain Ute Tribe
Celene Hawkins, Associate General Counsel, Ute Mountain Ute Tribe
H. Michael Keller, Special Counsel, Ute Mountain Ute Tribe
Scott Clow, Environmental Programs Director, Ute Mountain Ute Tribe
Shaun McGrath, Regional Administrator, U.S. EPA, Region 8
JoAnn Chase, Director, American Indian Environmental Office, US EPA
Reid Rosnick, EPA Office of Radiation and Indoor Air

Attachment 1

UTE MOUNTAIN UTE TRIBE

P.O. Box 248
Towaoc, Colorado 81334-0248
(970) 565-3751

April 14, 2014

Ms. Gina McCarthy
Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

RE: Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe

Dear Administrator McCarthy:

On March 13 and 17, 2014, the Ute Mountain Ute Tribe ("Tribe") met with officials in the Environmental Protection Agency's (EPA) headquarters and Region 8 offices regarding the Tribe's concerns about federal regulatory actions and decisions regarding the White Mesa Mill (a uranium mill located in southeastern Utah and approximately three miles from the Tribal community in White Mesa). I appreciate the time we spent with your agency discussing the Tribe's concerns on the two federal regulatory issues contained in the attached briefing papers (which we provided the EPA prior to the March 2014 meetings).

I would like to reiterate the specific, bulleted requests contained in the attached briefing papers. In particular, I reiterate the Tribe's request that the EPA consult with the Tribe about the proposed Subpart W NESHAP rulemaking early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.

Please contact Scott Clow, Environmental Programs Department Director, at (970) 564-5432 or sclow@utemountain.org or Celene Hawkins, Associate General Counsel, at (970) 564-5642 or chawkins@utemountain.org to set the dates where we can meet to discuss our concerns regarding the White Mesa Mill. I am certain that, by working together, we can do what is right for the people of White Mesa and the surrounding communities.

Sincerely,

Manuel Heart

Manuel Heart
Chairman
Ute Mountain Ute Tribe

Cc: Tribal Council
Peter Ortego, General Counsel, Ute Mountain Ute Tribe
Celene Hawkins, Associate General Counsel, Ute Mountain Ute Tribe
H. Michael Keller, Special Counsel, Ute Mountain Ute Tribe
Scott Clow, Environmental Programs Director, Ute Mountain Ute Tribe
JoAnne Chase, Director, American Indian Environmental Office, U.S. EPA
Shaun McGrath, Regional Administrator, U.S. EPA, Region 8

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN AUTHORIZATION OF NEW SOURCES OF ALTERNATE FEED MATERIAL AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. Under its current Radioactive Materials License, the WMM is licensed to receive and process both ore and alternate feed material from specific, approved CERCLA and FUSRAP sites. The WMM currently processes alternate feed material from approved sites, and the WMM also has two pending requests with the State of Utah to add new alternate feed sources to its Radioactive Materials License. The United States Environmental Protection Agency ("EPA") plays an important role in determining whether a facility like the WMM can continue to process alternate feed material because the EPA is responsible for determining whether the White Mesa Mill meets Section 121(d)(3) of CERCLA and 40 C.F.R. § 300.440 of the National Contingency Plan (also known as the "Off-Site Rule"), which mandates that such material may only be transferred to a facility that is operating in compliance with applicable federal and state law.[1]

There are several serious and ongoing environmental contamination issues at the WMM. First, the WMM has caused groundwater contamination beneath the facility, and the constituents present in the contaminated groundwater indicate containment failure or releases from the facility's legacy tailings impoundments.[2] Second, there is uncontroverted scientific evidence that off-site migration of both uranium and vanadium from the WMM facility operations has caused the contamination of surface water, land, and vegetation (on lands located off the WMM property). Third, the WMM has violated and is currently violating the federal radon emissions standards in 40 C.F.R. Part 61, subpart W: it is in violation of the federal work practice standard that limits uranium mills to only two tailings impoundments in operation at any one time; and between June of 2012 and the end of 2013, Radon-222 emissions from one of the tailings cells at the WMM exceeded the federal numeric emissions standard. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation, three of which were built before 1989.

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[1] The Off-Site Rule is designed to ensure that wastes from CERCLA response actions are only disposed of in properly controlled and compliant off-site facilities and to avoid having such wastes contribute to present or future environmental problems at those facilities. *See, e.g.*, 58 FR 49200-01 ("The purpose of this off-site regulation is to avoid having CERCLA wastes from CERCLA-authorized or -funded response actions contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound. Congress and EPA have always believed that a CERCLA cleanup should be more than a relocation of environmental problems, and have attempted to ensure the proper treatment and disposal of CERCLA wastes removed from a CERCLA site.").

[2] According to an industry expert retained by the Tribe, the liner systems in Tailings Cells 1, 2, and 3 (the legacy cells built when the WMM opened in the early 1980s) are simply unsuitable for their current use because: (a) the liners did not meet industry standard when they were installed; (b) the PVC geomembrane is not suitable for an acidic environment (and cannot reasonably be expected to have survived more than 30 years in such an application, particularly with the presence of alternate feed material solvents); (c) the industry standard has become considerably more robust since installation because of failures in similar systems; and (d) there is considerable evidence that the liners are already leaking.

The presence of alternate feed material at the WMM exacerbates the existing contamination issues at the WMM. The presence of alternate feed material containing solvents and other chemicals in the legacy tailings impoundments increases the risk of containment failure and groundwater contamination from those impoundments. The presence of alternate feed material at the WMM also increases the complexity of both groundwater monitoring and air monitoring at the facility. Finally, the properties of certain types of alternate feed material (e.g., material containing higher uranium content or material that poses increased risks of exposure through fugitive dust events) increase the risk of environmental contamination and human health impacts from the WMM.

As part of an effort to address the risk of catastrophic contamination from the WMM, the Tribe has exhaustively documented its concerns and provided scientific data and reasonable requests related to the regulation of the WMM to the State of Utah and to the EPA. Despite such efforts, the EPA has continued to make Off-Site Rule Determinations to allow the WMM to receive alternate feed material from CERCLA sites. Given the level of effort that the Tribe has expended to engage the EPA in a discussion about the WMM, the Tribe is disturbed and disappointed to see that, as recently as December of 2013, the EPA has undertaken only a cursory and incomplete[3] analysis of whether the WMM is an acceptable facility to receive CERCLA waste.

The Tribe now requests that the EPA take the following actions to ensure that the Off-Site Rule determinations properly reflect the EPA's trust responsibility to protect UMU Tribal members, lands, water, and other Indian Trust Assets from harm caused by the White Mesa Mill:

- Remove the WMM from any EPA list of sites available to receive alternate feed material from CERCLA cleanup sites (and stop approving any CERCLA remedial action plan or other cleanup plan that relies on costs or other considerations associated with the transport of alternate feed material to the WMM) until the WMM has addressed the existing environmental contamination issues and has concurrently reclaimed its legacy tailings impoundments.
- Undertake much more robust analysis during any future Off-Site Rule determinations for the WMM (including, but not limited to, analysis of compliance involving all regulatory agencies or divisions with responsibilities and authorities over the facility).

[3]For example, during a recent Off-Site Rule determination, the EPA only received input from the Utah Division of Radiation Control, and not the Utah Division of Air Quality (the agency responsible for administering the Clean Air Act (and the recent Radon-222 violation)).

ISSUE SUMMARY
ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN NESHAPS VIOLATIONS AT THE WHITE MESA MILL, UTAH

The White Mesa Mill ("WMM"), a uranium processing mill located in southeastern Utah and adjacent to the Ute Mountain Ute Tribe's ("Tribe") White Mesa community, is currently licensed by the State of Utah under the Atomic Energy Act, 42 U.S.C. § 2011 *et seq*. The WMM is subject to and in violation of the National Emission Standards for Radon Emissions from Operating Mill Tailings promulgated as a National Emission Standard for Hazardous Air Pollutants under the federal Clean Air Act and published in 40 C.F.R. Part 61, subpart W ("Subpart W NESHAP"). The Subpart W NESHAP imposes both a Radon-222 air emission standard on the tailings impoundments at the WMM and work practice standards for design, construction and operation of tailings impoundments that limit a uranium mill to only two tailings impoundments in operation at any one time. In designing these standards, EPA intended to limit radon emissions, ensure timely and efficient reclamation of impoundments, and avoid increased pollution of ground and surface waters. While the Utah Division of Air Quality ("UDAQ") has authority to enforce the Subpart W NESHAP through air quality permits, the United States Environmental Protection Agency ("EPA") has federal authority and responsibilities to enforce the Subpart W NESHAP at the WMM.

The WMM has violated and is currently violating the work practice standard by operating more than two tailings impoundments. The WMM has at least five impoundments containing 11(e)(2) byproduct material that are in operation within the meaning of the NESHAP work practice standard,[1] and the reclamation plan for the facility does not require the facility owners to place permanent radon barriers (or final caps to simultaneously address radon emissions and groundwater contamination) until final closure and reclamation of the facility. The EPA agrees that the WMM is currently violating the Subpart W NESHAP work practice standard, but has not taken enforcement action because some of the impoundments are covered in water. The Tribe is very concerned that the lack of enforcement by either the UDAQ or the EPA presents a heightened long-term risk of exposure to radon for the Ute Mountain Ute Tribal members living in the White Mesa Community. The Tribe has repeatedly documented its concerns regarding the work practice standard violation to the State of Utah and the EPA. The Tribe is not alone in its concerns. By letter dated January 29, 2014, the Grand Canyon Trust gave notice of its intent to bring a citizen suit under the Clean Air Act against Energy Fuels Incorporated for the past and ongoing violations of the numeric radon emission and radon work practice standards of the Subpart W NESHAP at the White Mesa Mill.

[1] The WMM has at least five impoundments that are currently licensed to receive 11(e)(2) byproduct material, all five have been used for disposal of 11(e)(2) byproduct material, all five are currently being used for disposal of 11(e)(2) byproduct material or are in standby status, and none are in final closure. *See* 40 C.F.R. § 61.252. WMM's Utah Groundwater Protection Discharge Permit also authorizes disposal of 11(e)(2) byproduct material (wastes produced from the processing of uranium ore primarily for its source material content) in all five impoundments.

In the spring of 2013, the Tribe discovered that, in June of 2012, Radon-222 emissions from one of the tailings impoundments at the WMM exceeded the federal emissions standard (with average levels 21.5 percent higher than the regulatory emissions limit and with emissions in certain areas of the impoundment more than 40 times the emissions goal set by the WMM's worker safety program). This emissions violation occurred during the de-watering process on the tailings impoundment, even though a consultant for the WMM owner documented that the violation could be permanently eliminated if the WMM owner placed a two-foot random fill (dirt) cover on the tailings impoundment. In late 2013, after almost two years of exposing the Tribal community in White Mesa to illegal levels of Radon-222, the WMM owner was able to bring the facility back under the federal Radon-222 emissions standard. However, because the WMM owner still has not placed even the recommended two-foot random fill cover on the tailings impoundment, and because the de-watering process will continue on that tailings impoundment, the Tribe anticipates that there will be future Radon-222 exceedances in the near future (and as the WMM de-waters the legacy tailings impoundments).

The 2012-2013 Radon-222 exceedance (and lack of appropriate regulatory responses from the UDAQ and the EPA) confirms the Tribe's long-term concerns about Tribal member exposure to radon during the life of the facility. If the WMM continues to operate in violation of the work practice standard and continues to perform tailings impoundment dewatering without more aggressive regulation by the State of Utah and the EPA, the Tribe can expect a high risk of long-term radon exposure to its community in White Mesa. The Tribe is very concerned about the acute human health risk presented by the ongoing and anticipated future radon emissions violations at the WMM.

The Tribe requests the EPA take the following action to ensure the EPA is meeting its regulatory and trust responsibilities to protect UMU Tribal members from harm caused by the WMM:

- Immediately consult with the Tribe about the proposed Subpart W NESHAP rulemaking. Because the UDAQ has indicated that the proposed Subpart W NESHAP rulemaking will address the work practice standard violation at the WMM, and because the Tribe is concerned that the UDAQ and the EPA may be attempting to continue to allow the violation to occur so long as there is water in some of the WMM tailings impoundments, the Tribe insists that the EPA conduct consultation with the Tribe early enough in the process that the Tribe can give meaningful and effective input prior to publishing the proposed rule for public comment.
- Immediately consult with the Tribe about: (1) EPA's decision not to pursue enforcement on the work practice standard violation; and (2) the Tribe's concerns about the Radon-222 emissions violation (including, but not limited to, the Tribe's concerns about the duration of the 2012-2013 violation, the Tribe's concerns that no federal or state agency notified the Tribe of this acute human health risk, and the Tribe's concerns that this type of emissions violation will continue to occur at the WMM).

Attachment 2

UTE MOUNTAIN UTE TRIBE'S INITIAL QUESTIONS
Environmental Protection Agency, Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings, Proposed Rule
40 C.F.R. Part 61
Submitted on June 13, 2014 in preparation for government-to-government consultation, July 10, 2014

I. EPA, INDIAN TRIBES, AND EXECUTIVE ORDER 13175

1. The Environmental Protection Agency's (EPA) statement regarding compliance with Executive Order 13175 states that the Subpart W rulemaking action does not have "tribal implications" because the rulemaking does not impose regulatory requirements on tribal governments. Please be prepared to discuss how the following issues impact the EPA's Executive Order 13175 analysis:

    - Although Native Americans make up only 1.4 percent of Utah's racial profile (and 0.9 percent of the United States' racial profile), they make up 55.8 percent of the racial profile for San Juan County, Utah (the county where the White Mesa Mill (WMM) is located).
    - The WMM facility is located on aboriginal lands of the Ute Mountain Ute Tribe.
    - The WMM facility is located adjacent to land and other Indian Trust Assets held in trust by the United States on behalf of the Ute Mountain Ute Tribe (and less than 3 miles from the nearest Tribal resident).
    - The Tribal community located in White Mesa is downgradient of the WMM facility.
    - The Tribal community located in White Mesa is completely dependent on groundwater supplies located underneath the WMM facility and tailings cells.
    - Activities and operations at the WMM have already impacted Tribal members' abilities to use surface, plant, wildlife, and surface water resources on public and Tribal lands.

2. Please be prepared to discuss how the EPA will address Tribal concerns during this Subpart W rulemaking and related rulemaking processes (including, but not limited to, the anticipated revision to 40 C.F.R. Part 192).

3. Please be prepared to discuss how or whether the EPA undertook analysis of how this rulemaking will impact UMU Tribal members, UMU Tribal lands, and Indian Trust Assets.

II. NESHAPS/CLEAN AIR ACT QUESTIONS

4. Has the EPA evaluated establishing a lesser quantity or different criteria for major sources of radionuclides under Section 112(a)(1) of the CAA? *See* footnote 2, page 25390 of the proposed rulemaking (noting that *none* of the uranium recovery facilities are major sources under NESHAPS).

5. On page 25390 of the proposed rulemaking, the EPA identifies the "source category" for Subpart W using 40 C.F.R. § 61.250 and the proposed definition of "uranium recovery facility." Has the EPA listed uranium recovery facilities as a category or subcategory of sources under Section 112(c) of the Clean Air Act? If so, please provide an explanation and documentation in advance of the consultation meeting.

6. On page 25390 of the proposed rulemaking, the EPA states, "Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings." However, the proposed Subpart W rulemaking only covers some HAP sources at uranium recovery facilities, and not others (such as stackhouses, ore pad, ore grinder, and the Mill yard, see Question 7, *infra*). Please explain the EPA's rationale for excluding such HAP sources at conventional uranium mills.

7. On page 25390 of the proposed rulemaking, the EPA states: "We presently have no data or information that shows any other HAPs being emitted from these impoundments." Please provide a response to the following initial questions, data, and information regarding other HAPs that may be emitted from the WMM.

   - The WMM's 10 C.F.R. § 40.65 environmental airborne particulate monitoring program monitors for natural uranium (Uranium-238, Uranium-234, Uranium-235), Thorium-230, Radium-226, and Lead-210. This air monitoring program has detected all four isotopes at all of the air monitoring stations. Additionally, the WMM has identified Lead-210, Thorium-230, Thorium-232, Polonium-210, Radium-226, and Radium-228 in wastewater samples from the tailings impoundments. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
   - The WMM processes uranium ore. During the uranium storage and milling processes, there may be more than three dozen radioactive isotopes present at the WMM facility (including actinium, astatine, bismuth, francium, lead, polonium, protactinium, radium, radon, thallium, thorium, and uranium). *See* Uranium Decay Series diagram on page 44 of the Technical and Regulatory Support document. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
   - The WMM's uranium milling process uses significant quantities of chemicals (sodium chlorate is used during ore oxidation; sulfuric acid and flocculants are used during the leaching and clarification; secondary amines/kerosene, tri-alkyl amines/tributyl phosphate modifier, and quaternary ammonium compounds/alcohol are used during the solvent extraction; chlorides and sulfates are used during pregnant liquor stripping; and ammonia hydroxide and sodium hydroxide during yellowcake precipitation). During the storage and use of these chemicals, and after these chemicals are disposed in the tailings impoundments, there may be significant emissions of HAPs at the WMM.

- The WMM processes alternate feed materials. During the alternate feed storage and milling processes, other radioactive isotopes, non-metal compounds, and other regulated HAPs may be emitted from the WMM.
- The WMM processes vanadium ore. Vanadium is considered to be dangerous to life and health by both the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health, and may be listed as a HAP in the future. The WMM's vanadium recovery process uses a significant quantity of chemicals (sodium chlorate is used during the redox/pH adjustment; kerosene and secondary amines are used during the solvent extraction; soda ash is used during the vanadium pregnant liquor stripping process; and ammonia hydroxide is used during the vanadium precipitation). This indicates that the vanadium recovery process results in the emission of HAPs other than Radon-222 from the WMM facility.

8. On page 25390 of the proposed rulemaking, the EPA states that it evaluated the MACT standards applicable to major sources in the same industrial sector. Please provide the Tribe with this analysis prior to the consultation, and be prepared to explain the MACT analysis that the EPA performed during this rulemaking process.

9. Please explain how the EPA evaluated the use of a work practice standard, rather than an emissions standard, for the control of a HAP under the proposed rulemaking. *See* Section 112(h), Clean Air Act. Please specifically address the EPA's determination to remove the current emissions standard for existing impoundments. Please also explain how removing the emissions standard from Subpart W will affect: (a) how the WMM facility sets and meets the ALARA goal to protect worker and adjacent communities from radionuclides; and (b) monitoring of radon emissions under 10 C.F.R. Part 40, Appendix A.

III. SUBPART W AND CLOSURE OF LEGACY IMPOUNDMENTS

10. In 1989, when the EPA proposed the current Subpart W NESHAP, the EPA concluded that, "Existing mill tailing piles are large piles of waste that emit radon. There is nothing that can be done to reduce the amount of radon they emit except cover them." 54 FR 9644 (March 7, 1989). EPA crafted Subpart W to prohibit uranium mills from having more than two tailings impoundments in operation. Explain why the EPA has not required closure of the legacy Tailings Cells 1, 2, and 3 at the WMM, as contemplated and required by the current NESHAP.

11. In this proposed rulemaking, the EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Explain how the EPA can justify the long-term risk of having almost 300 acres of tailings impoundments that are either in operation or in closure but without a permanent radon barrier at the WMM. *See also* questions on conventional and non-conventional impoundments.

IV. DEFICIENT OR INCORRECT ANALYSIS OF OPERATIONS AND FACILITIES AT THE WMM

12. The owners of the WMM state in the June 1, 2009 letter response to EPA's CAA Section 114 Information Request that Tailings Cells 1, 2, and 3 meet the requirements of 40 C.F.R. 192.32(a). The WMM owners specify that these specific Tailings Cells meet the design and operating requirements under 40 C.F.R. 264.221(a). Please explain how the EPA evaluated the WMM owners' assertions regarding compliance with 40 C.F.R. 192.32(a) and 40 C.F.R. 264.221(a), given the following:
    - The liners in Tailings Cells 1, 2, and 3 were designed for a 15-year life and were installed between May 1980 and September 1982. These impoundments have already been in operation for over 30 years.
    - Contamination of the shallow groundwater underlying Tailings Cells 1, 2, and 3 has been documented and is the subject of investigation and corrective action to address elevated chloroform, nitrate and chlorides. There is significant evidence that the liners on Tailings Cells 1, 2, and 3 have already allowed migration of waste out of the impoundments into the adjacent groundwater.
    - The Agreement State and the WMM owners treat the shallow groundwater aquifer under the WMM facility as the leak detection system for Tailings Cells 1, 2, and 3 (and developed a groundwater monitoring program that can detect tailings cell leakage only after waste has migrated out of these legacy impoundments).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 do not have appropriate chemical properties and sufficient strength and thickness to prevent failure due to conditions outlined in 40 C.F.R. § 264.221(a)(1).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 are not compatible with alternate feed materials contained in the impoundments.

13. Several important sections of the proposed rulemaking rely on the provisions of 40 C.F.R. § 264.221(c) (and not 40 C.F.R. § 264.221(a)) to explain protection of groundwater or other environmental analysis. *See, e.g.*, page 25393 (setting forth specific liner requirements from 40 C.F.R. § 264.221(c)); page 25397 (specifically relying on safeguards from a leak detection system); page 25401 (specifying that the proposed GACT is for double liners on non-conventional impoundments). The provisions of 40 C.F.R. § 264.221(c) are significantly more protective of groundwater, human health, and the environment.

    - Is the EPA taking the position that all conventional impoundments and non-conventional impoundments must meet the requirements of 40 C.F.R. § 264.221(c)? If so, please clarify the EPA's position on whether Tailings Cells 1, 2, and 3 at the WMM meet the requirements of 40 C.F.R. § 264.221(c).

    - If the EPA is <u>not</u> taking the position that 40 C.F.R § 264.221(c) applies to all conventional and non-conventional impoundments, please explain how the EPA addressed risks to groundwater from legacy impoundments like Tailings Cells 1,

2, and 3. Please specifically address how the EPA assessed the risk of groundwater contamination from Tailings Cell 1. *See* question 12, *supra*.

14. Please explain how (or if) the EPA's specific analysis of the WMM facility addressed the following:

    - Cell 2 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
    - Method 115 monitoring on Cell 2 detected a Subpart W NESHAPS violation in 2012/2013 over the 20 pCi/m2-s limit.
    - Cell 3 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
    - Cell 3 is currently the only tailings cell at the WMM that receives certain forms of 11(e)(2) byproduct material (materials trucked in, including ISL waste).
    - The WMM facility has not historically operated its "conventional" and "non-conventional" tailings impoundments separately. Tailings Cell 4A was operated as a "non-conventional" impoundment, which resulted in surface and groundwater contamination until the cell was retrofitted starting in 2008. Tailings Cell 4B is currently operated as a "non-conventional" impoundment, but the WMM owners indicate that it will be used as a "conventional" impoundment in the future.
    - Under currently approved and proposed reclamation plans for the WMM, the permanent radon barriers will not be placed on *any* tailings impoundments until final reclamation at the facility.

V. NON-CONVENTIONAL IMPOUNDMENTS

15. How did the EPA develop the proposed definition of "non-conventional impoundments"?

16. Please explain how the EPA will distinguish between conventional and non-conventional impoundments.

    a. Is there a minimum amount of liquid that must be present in the pond for the EPA to classify a tailings impoundment as a non-conventional impoundment, or can a facility owner convert a conventional impoundment into a non-conventional impoundment by adding the minimum 1m of liquid on the top of the impoundment?

    b. Will the final reclamation or removal plan for a tailings impoundment determine whether it qualifies as a "non-conventional impoundment"?

        - Please explain how the EPA will treat Tailings Cell 1 at the WMM (noting that the WMM owners plan to remove solids from the cell upon final reclamation, but then permanently dispose of debris from the Mill facilities and contaminated soil in the cell). *See* June 1, 2009 Response Letter at 6; page 25405 of the proposed rulemaking (addressing the disposal of byproduct material like deconstruction material during facility reclamation).

- Please explain how the EPA will treat Tailings Cell 4B at the WMM (which the WMM owner is currently operating as a non-conventional impoundment, but which will become a conventional impoundment before final reclamation).

17. The WMM is currently authorized to temporarily place liquid 11(e)(2) byproduct material in "Roberts Pond" (before pumping the liquid into Tailings Cells 1 and 4B). Does Roberts Pond meet the proposed definition of a "non-conventional impoundment"? *See* pages 25390, 25393 of the proposed rulemaking (addressing "holding" and "collection" ponds). Please explain how EPA has assessed the Radon-222 emissions from Roberts Pond and from the regular transfer of process water from Roberts Pond to Tailings Cells 1 and 4B.

18. Please explain the EPA's rationale for allowing non-conventional impoundments to exist until removal at facility closure.

    - Did the EPA analyze whether allowing water-covered impoundments to exist for the life of a facility increases risks of groundwater and surface water contamination? Please see question 12 (and explain EPA's position on the 15-year design life for Tailings Cell 1 at the WMM).
    - How will the EPA ensure that non-conventional impoundments are periodically retrofitted to ensure that the impoundments do not contaminate groundwater and surface water?

19. EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Please explain why this linear relationship does not also justify size restrictions on non-conventional impoundments (and please specifically address how this linear relationship will impact Radon-222 emissions when large non-conventional impoundments are dewatered and closed).

20. How has the EPA analyzed what risks non-conventional impoundments (including large non-conventional impoundments like Tailings Cell 1 at the WMM) will pose to human health and the environment when they are de-watered and decommissioned?

21. How will the proposed rule address tailings impoundments that are used as conventional and non-conventional impoundments (such as Tailings Cells 4A and 4B at the WMM)? How will the EPA "count" these cells using the 2-cell limit in the conventional impoundment work practice standard?

22. The EPA's analysis that using liquids to cover tailings cells "has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero" is insufficient to demonstrate that Tailings Cell 1 at the WMM has a radon flux of "almost zero" (or even under 20 pCi/m2-s).

Based on the information and questions below, please provide the EPA's specific analysis of the calculated radon emissions from Tailings Cell 1, Tailings Cell 4B, and Roberts Pond at the WMM. Please then explain how EPA calculates the dose to the White Mesa Tribal community (considering radon emissions from Tailings Cell 1 and 4B and Roberts Pond, along with radon emissions from "conventional" impoundments 2, 3, and 4A).

a. The proposed rulemaking recognizes that covering tailings impoundments with water does not reduce radon emissions to zero. *See, e.g.*, Radon Emission from Evaporation Ponds (noting that the radon flux above some evaporation ponds can be significant/exceed 20 pCi/m2-s).
b. The proposed rulemaking contemplates the use of radium-laden "process water" to provide liquid covers on non-conventional impoundments, but does not address whether the use of radium-laden process water increases the radon emissions from a non-conventional impoundment. The EPA analysis justifying the use of the 1 meter water cover relies on the assumption that the water cover is not laden with radium. The EPA analysis also calculates significant radon flux from non-conventional impoundments containing radium-laden water. Please justify the EPA's position that 1 m of radium-laden process water can decrease radon flux from tailings impoundments like Tailings Cell 1 at WMM to zero.
c. The EPA's analysis of radon emissions from liquid-covered impoundments recognizes that there are significant radon emissions during the transfer of radium-laden waters to and between tailings impoundments and during enhanced evaporation sprays, but it does not calculate or address these emissions for conventional mills like the WMM.
d. Using the radon flux equation contained in Section 4.0 of the Radon Emissions from Evaporation Ponds report along with the actual radium content[1] in Tailings Cell 1, the Tribe's initial calculation on the radon flux from Tailings Cell 1 is 327 pCi/m2-s (not including emissions during transfer into Cell 1 or during enhanced evaporation sprays).

VI. CONVENTIONAL IMPOUNDMENTS

23. The Tribe is generally confused about the EPA's approach to Tailings Cells 2 and 3 at the WMM. The EPA seems to recognize that neither of these tailings cells meets the work practice standards proposed in this rulemaking. *See* page 25395 of the proposed rulemaking (noting that Cell 3 could not meet the work practice standards). Given that both tailings impoundments are still licensed by the Agreement State to receive liquid and solid 11(e)(2) byproduct material and that neither tailings impoundment has a tailings closure plan with milestones for placement of a permanent radon barrier, please explain how the EPA can continue to justify removing the monitoring requirements and emissions limits that currently apply to these impoundments.

[1] To determine the actual radium content, the Tribe used the 32,700 pCi/L Gross Radium Alpha concentration provided in the in the 2013 Annual Tailings Report.

24. The Tribe is concerned that, although Tailings Cell 2 had a recent violation of the 20 pCi/m2-s emissions limit that applies to existing impoundments (and although that violation was detected during monitoring conducted under Method 115), the EPA did not consider Cell 2 when considering how the proposed rulemaking would impact the WMM. Please explain why the EPA omitted any analysis of Cell 2 and the recent Subpart W violation at Cell 2. Please also explain how the EPA will ensure that emissions from Tailings Cell 2 do not exceed 20 pCi/m2-s between now and when the final radon barrier is placed during final reclamation of the entire facility (given that the EPA is proposing to eliminate both the emissions limit and the monitoring to detect Radon-222 emissions over 20 pCi/m2-s).

25. The proposed rulemaking references the use of an "interim cover" on Tailings Cells 2 and 3 at the WMM. The Tribe is concerned that the WMM owners have used this "interim cover" on Tailings Cell 2 for more than a decade (and that the use of this cover has already resulted in Radon-222 emissions of over the 20 pCi/m2-s limit) and that the Reclamation Plan for the WMM contemplates the use of such "interim covers" until final reclamation at the facility. Please explain whether and how the EPA justifies the use of interim covers (and not the immediate placement of permanent radon barriers).

VII. APPLICABILITY OF 40 C.F.R. PART 192

26. A significant portion of the EPA's analysis in the proposed rulemaking (including analysis on impacts to the environment and human health, analysis on weather and other hazards, and economic analysis) rests on the assumption that all tailings impoundments (conventional and non-conventional) meet the standards set forth in 40 C.F.R. § 192.32(a)(1) and 40 C.F.R. § 264.221. How will the EPA ensure that all the tailings impoundments at the WMM facility meet the applicable federal standards?

27. The EPA is proposing to eliminate internal cross references to the sections of 40 C.F.R. Part 192 that cover placement of permanent radon barriers on tailings impoundments. Additionally, although the EPA identified the need to better define "closure" under Subpart W, the revisions to the terms "standby" and "operation" in the proposed rulemaking do not define or address "closure" under the revised Subpart W NESHAP regulations.
    - How will the EPA determine whether a tailings impoundment has entered "final closure" for Subpart W NESHAP purposes?
    - If the EPA no longer intends to utilize other portions of 40 C.F.R. Part 192 (including, but not limited to, the definitions of "Tailings Closure Plan," "Permanent Radon Barrier," and requirements that the permanent radon barrier be constructed as expeditiously as possible and in accordance with a tailings closure plan), how will the EPA ensure that permanent radon barriers are properly placed on tailings cells? Here, please address the Tribe's concern that, under current reclamation plans for the WMM, the permanent radon barriers for Cells 2 and 3 will not be placed under final reclamation of the facility (and that there are no Tailings Closure Plans, as defined in 40 C.F.R. Part 192, with milestones for the expeditious placement of the permanent radon barriers).

28. The Tribe is concerned that the Tribal community in White Mesa will be exposed to elevated levels of Radon-222 when the WMM facility undertakes de-watering or other closure activities or allows Tailings Cells 2 and 3 to remain open under an "interim cover." Please explain how the EPA has specifically assessed the anticipated dose to the White Mesa Community *during* the closure period. Please also explain how the EPA will ensure that Tribal members, Tribal lands and other Indian Trust Assets are not exposed to Radon-222 emissions in excess of 20 pCi/m2-s during the closure period.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:12 PM
To: Thornton, Marisa
Subject: FW: Memo to the Subpart W Docket

From: Nesky, Anthony
Sent: Tuesday, June 17, 2014 11:04 AM
To: Miller, Beth
Subject: RE: Memo to the Subpart W Docket

Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Miller, Beth
Sent: Tuesday, June 17, 2014 10:47 AM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: RE: Memo to the Subpart W Docket

Done!

Success!

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Docket ID: EPA-HQ-OAR-2008-0218

Document ID: EPA-HQ-OAR-2008-0218-DRAFT-0104

Title: Memo to: EPA Docket (EPA-HQ-OAR-2008-0218)
Document Type: SUPPORTING & RELATED MATERIALS
Status: Metadata_Ready

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Nesky, Anthony
Sent: Tuesday, June 17, 2014 10:28 AM
To: Miller, Beth
Cc: Rosnick, Reid
Subject: Memo to the Subpart W Docket

Dear Beth:

Could you please put the following memo in the Subpart W Docket? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:12 PM
To: Thornton, Marisa
Subject: FW: Congressional Inquiry

From: Lewis, Josh
Sent: Tuesday, June 17, 2014 12:50 PM
To: Rosnick, Reid; Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Cc: Stahle, Susan
Subject: RE: Congressional Inquiry

Ok. I'm going to shoot for Thursday morning…if that works for Udall's staff I'll send out a scheduler w/ exact time and call in #.

Josh

From: Rosnick, Reid
Sent: Tuesday, June 17, 2014 11:48 AM
To: Lewis, Josh; Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Cc: Stahle, Susan
Subject: RE: Congressional Inquiry

Josh,

My only request is that the call not take place this Thursday afternoon. I'm on sick leave.

Reid

From: Lewis, Josh
Sent: Tuesday, June 17, 2014 11:27 AM
To: Rosnick, Reid; Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Cc: Stahle, Susan
Subject: RE: Congressional Inquiry

Hi All,

Just checking to see if any of you have questions or want to discuss this request further before I go ahead and set up a call w/ Udall's staff for later this week or early next. Thanks

Josh Lewis
EPA/Office of Congressional and Intergovernmental Relations
Desk: 202 564 2095
Cell: 202 329 2291

From: Rosnick, Reid
Sent: Friday, June 13, 2014 11:22 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Cc: Lewis, Josh; Stahle, Susan
Subject: Congressional Inquiry

All,

Staff from Senator Udall (CO) have contacted our congressional office regarding issues with the Ute Mountain Ute tribe. The tribe contacted the Senator's office to discuss the Subpart W proposed rulemaking. I believe they will be expressing their disappointment with our consultation taking place after the rule was proposed. I explained to Josh Lewis that we would be available next week to speak to the staff regarding our communications with the tribe over the last 5 years.
Thanks

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:12 PM
To: Thornton, Marisa
Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

-----Original Message-----
From: Diaz, Angelique
Sent: Tuesday, June 17, 2014 1:27 PM
To: Harris, Jennifer
Cc: Rosnick, Reid
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Not sure. Do you know how HQ is handling it? I would defer to them.

Reid, do you know?

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

-----Original Message-----
From: Harris, Jennifer
Sent: Tuesday, June 17, 2014 11:25 AM
To: Diaz, Angelique
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Hi, Angelique, is this consultation for public view or should be treated with privacy, which does not get published just put in the system with the documents?

-----Original Message-----
From: Diaz, Angelique
Sent: Tuesday, June 17, 2014 11:15 AM
To: Harris, Jennifer

Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Jennifer, the consultation request letter is the first attachment. There second attachment is additional information that was included.

-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

-----Original Message-----
From: Jackson, Scott
Sent: Tuesday, May 13, 2014 7:28 AM
To: Diaz, Angelique
Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Angelique,

Looks like this control has now bounced Art's way. I thought HQ was taking the lead? What am I forgetting?

Scott

Scott Jackson, Unit Chief
Indoor Air, Toxics and Transportation Unit U.S. EPA Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
(303) 312-6107

-----Original Message-----
From: Palomares, Art
Sent: Monday, May 12, 2014 4:15 PM
To: Jackson, Scott; Mitre, Alfreda; Reynolds, Cynthia
Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

The attached documents have been controlled to me for a response. Please take a look at the documents and provide me with your portion of the response by no later than May 19, 2014, to meet the controlled correspondence deadline. If you have questions, please call me at 312-6053.

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:11 PM
To: Thornton, Marisa
Subject: FW: Consultation Follow-Up With Ute Mountain Ute Tribe

-----Original Appointment-----
From: Colin Larrick [mailto:clarrick@utemountain.org]
Sent: Thursday, June 19, 2014 9:56 AM
To: Rosnick, Reid
Subject: Accepted: Consultation Follow-Up With Ute Mountain Ute Tribe
When: Wednesday, June 25, 2014 12:00 PM-2:00 PM (UTC-07:00) Mountain Time (US & Canada).
Where: 866-299-3188, code 2023439563#

Memo to: EPA Docket (EPA-HQ-OAR-2008-0218)

From: Anthony Nesky, EPA/OAR/ORIA/RPD

Subject: Request for a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule."

On June 10, 2014, Jennifer Thurston of INFORM Colorado called Anthony Nesky of the EPA Radiation Protection Division (RPD) in the Office of Radiation and Indoor Air (ORIA), in the Office of Air and Radiation (OAR), at the U.S. Environmental Protection Agency (EPA) to request a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule," 79 Fed. Reg. 25,388 (May 2, 2014), which proposes revisions to 40 CFR Part 61, Subpart W. Ms. Thurston explained that she was requesting the public hearing on behalf of a number of organizations who wanted public hearings in multiple locations.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:12 PM
To: Thornton, Marisa
Subject: FW: Memo to the Subpart W Docket
Attachments: Memo-to-Docket-requesting-hearing-6-10-14.pdf

From: Nesky, Anthony
Sent: Tuesday, June 17, 2014 10:28 AM
To: Miller, Beth
Cc: Rosnick, Reid
Subject: Memo to the Subpart W Docket

Dear Beth:

Could you please put the following memo in the Subpart W Docket? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:13 PM
To: Thornton, Marisa
Subject: FW: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

From: Miller, Beth
Sent: Tuesday, June 17, 2014 8:44 AM
To: Rosnick, Reid
Subject: RE: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

You're so very welcome

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Tuesday, June 17, 2014 8:43 AM
To: Miller, Beth
Subject: RE: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

Thanks!

From: Miller, Beth
Sent: Tuesday, June 17, 2014 8:41 AM
To: Rosnick, Reid
Subject: RE: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

Done!

Success!

You have created a new document with the following attrit

Docket ID: EPA-HQ-OAR-2008-0218

Document ID: EPA-HQ-OAR-2008-0218-DRAFT-0103

Title: Letter from The National Tribal Air Association (NTAA)
Document Type: SUPPORTING & RELATED MATERIALS
Status: Metadata_Ready

Current Assignee: Akram, Assem (EPA)

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Monday, June 16, 2014 8:41 AM
To: Miller, Beth
Subject: FW: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

Hi Beth,

Can you please place the attachment only in the Subpart W docket. Thanks!

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 13, 2014 4:46 PM
To: Rosnick, Reid; Group A-AND-R-DOCKET
Cc: Childers, Pat; Harrison, Jed; Mehrdad.Khatibi@NAU.EDU; ann-marie.chischilly@nau.edu; Cristina Gonzalez-Maddux; Flynn, Mike; Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Bill.Thompson@Penobscotnation.org; air@lldrm.org; Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com; Kellie Poolaw (kelliej@pawneenation.org); greenleaf@kootenai.org; lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com
Subject: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

Hell Mr. Rosnick:

I am pleased to forward on a letter from the NTAA Chairman, Bill Thompson regarding EPA Docket # EPA-HQ-OAR-2008-0218. This letter requesting a comment period extension is in advance of NTAA's forthcoming comments on this proposed rule.

Please confirm receipt of this letter and feel free to contact me with any clarification and/or questions regarding this request.

We look forward to response to this request.

Thank you,

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:13 PM
To: Thornton, Marisa
Subject: FW: Two quick fixes to Subpart W page and RPD home page

---

From: Romero, Carmen
Sent: Tuesday, June 17, 2014 10:22 AM
To: Nesky, Anthony
Cc: Herrenbruck, Glenna; Thornton, Marisa
Subject: RE: Two quick fixes to Subpart W page and RPD home page

Done!

From: Nesky, Anthony
Sent: Tuesday, June 17, 2014 10:14 AM
To: Romero, Carmen
Cc: Herrenbruck, Glenna; Thornton, Marisa
Subject: Two quick fixes to Subpart W page and RPD home page

Dear Carmen:

Thanks for your help yesterday. We were facing a hard deadline to update the Subpart W page. I have a minor fix for it. Could you please fix the envelope graphic on at the top of the page:

http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

We have announced that we are planning to extend the comment period for Subpart W, so we ought to update the home page as well. On the RPD home page, under

- "**Notice of Proposed Rulemaking** National Emission Standards for Hazardous Air Pollutants (NESHAPs)- Radon from Operating Uranium Mill Tailings EPA has released a Notice of Proposed Rulemaking that would revise "National Emission Standards for Radon Emissions from Operating Mill Tailings," Subpart W of 40 CFR Part 61. The public is invited to submit comments on the proposed rulemaking. Comments must be received in writing by July 31, 2014.

Please delete the last two sentences, and replace them with;

The comment period is open. The public is invited to submit comments on the proposed rulemaking.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:12 PM
To: Thornton, Marisa
Subject: FW: Two quick fixes to Subpart W page and RPD home page

---

From: Nesky, Anthony
Sent: Tuesday, June 17, 2014 10:28 AM
To: Romero, Carmen
Subject: RE: Two quick fixes to Subpart W page and RPD home page

Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Romero, Carmen
Sent: Tuesday, June 17, 2014 10:22 AM
To: Nesky, Anthony
Cc: Herrenbruck, Glenna; Thornton, Marisa
Subject: RE: Two quick fixes to Subpart W page and RPD home page

Done!

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Sent: Tuesday, June 17, 2014 10:14 AM
To: Romero, Carmen
Cc: Herrenbruck, Glenna; Thornton, Marisa
Subject: Two quick fixes to Subpart W page and RPD home page

Dear Carmen:

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The comment period is open. The public is invited to submit comments on the proposed rulemaking.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

************************ ATTACHMENT REMOVED ************************

This message contained an attachment which the administrator has caused to be removed.

************************ ATTACHMENT REMOVED ************************

Attachment name: [image001.jpg]
Attachment type: [image/jpeg]

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:13 PM
To: Thornton, Marisa
Subject: FW: Draft Agenda for the NTAA/EPA Policy Call
Attachments: removed.txt

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Monday, June 16, 2014 2:41 PM
To: Rosnick, Reid
Subject: Re: Draft Agenda for the NTAA/EPA Policy Call

Thanks for the corrections Reid.

Yes, you can assume that time frame if that works for you.

I will ensure that your name is correct on the final agenda.

I will ensure you get the call in information this week.

Thanks,

Andy
Andy Bessler
Project Director

National Tribal Air Association
Institute for Tribal Environmental Professionals
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
andy.bessler@nau.edu
www.ntaatribalair.org

From: <Rosnick>, Reid <Rosnick.Reid@epa.gov>
Date: Monday, June 16, 2014 11:33 AM

To: Andy Bessler <andy.bessler@nau.edu>, Jed Harrison <harrison.jed@epa.gov>
Cc: Toni Colon <Colon.Toni@epa.gov>
Subject: RE: Draft Agenda for the NTAA/EPA Policy Call

Hi Andy,

My only comment is my name is spelled Reid, not Reed. Other than that, should I assume a 20-25 minute presentation with 5-10 for comments/questions? Thanks

Reid

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Monday, June 16, 2014 1:39 PM
To: Harrison, Jed; Rosnick, Reid
Cc: Colon, Toni
Subject: Draft Agenda for the NTAA/EPA Policy Call

Hello Reid and Jed:

Please take a look at that attached draft agenda and let me know what changes you would like to see. Feel free to scrap it and send me another paragraph summarizing your presentation and offering a web link for more information.

I put down 30 minutes that includes time for Q and A.

Let me know if you have any questions!

Andy

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
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NESHAP Subpart W is a radon emission standard for operating uranium mill tailings. In accordance with the Clean Air Act Amendments of 1990, EPA formed a workgroup to review the standard.

EPA will provide up-to-date information on recent or upcoming conference calls, resources, public hearings and contact information. Please check back regularly, as more items will be added.

On this page:

Requests for a Public Hearing

EPA has received two requests for a public hearing on the proposed rulemaking for NESHAP Subpart W. EPA plans to conduct a public hearing in response to these requests. The Agency is currently planning the public hearing and will post the information regarding the public hearing (dates, location, times, registration information, etc.) on this website as soon as it has been finalized. Interested parties should check this website for updates.

- Memo to Docket on Telephone Request for Public Hearing (PDF) (1 pp, 196 KB About PDF)
- Letter from Uranium Watch (PDF) (1 pp, 42.9 KB About PDF)

Requests for Extension of the Public Comment Period

EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.

- Request from Uranium Watch (PDF) (2 pp, 58.9 KB About PDF)
- Request from NTAA (PDF) (1 pp, 32.4 KB About PDF)

EPA is proposing revisions to Subpart W.Comment period is open

"National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. The docket (EPA-HQ-OAR-2008-0218) for this proposed rulemaking may be accessed at Regulations.gov. Once in the docket, you can view the proposed rule and supporting documents. The public comment period currently ends on July 31, 2014. EPA plans to extend the public comment period.

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

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Download the Proposed Rule and Submit Comments on Line

- Notice of Proposed Rulemaking from theFederal Register.
- Fact Sheet on the Proposed Rule (2 pp, 52 K, About PDF)
- Submit Comments on line at Regulations.gov (Note: Comments may also be submitted by mail, see the Notice of Proposed Rulemaking for instructions)

Conference Call Information

EPA will hold quarterly conference calls with interested stakeholders. The next conference call will occur on **Thursday, July 3, 2014 at 11 AM EDT, 10am CDT, 9am MDT and 8am PDT. The call in number is 1-866-299-3188.** You will be prompted for a conference code, which will be 2023439563. After entering the conference code press the # key and you will then be placed into the conference call.

Year	1st Quarter January - March	2nd Quarter April - June	3rd Quarter July - September	4th Quarter October - December
2009				Minutes from December 3, 2009 conference call.
2010	Minutes from January 5, 2010 conference call.	Minutes from April 6, 2010 conference call.	Minutes from July 6, 2010 conference call.	Minutes from October 5, 2010 conference call.
2011	Minutes from January 5, 2011 conference call.	Minutes from April 7, 2011 conference call.	Minutes from July 7, 2011 conference call.	Minutes from October 6, 2011 conference call.
2012	Minutes from January 5, 2012 conference call.	Minutes from April 5, 2012 conference call.	Minutes from July 5, 2012 conference call.	Minutes from October 4, 2012 conference call.
2013	Minutes from January 3, 2013 conference call.	Minutes from April 3, 2013 conference call.	Minutes from July 11, 2013 conference call.	Minutes from October 17, 2013 conference call.

2014	Minutes from January 2, 2014 conference call.	Minutes from April 3, 2014 conference call.

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Documents

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Current Action
April 26, 2007 Notice of Intent to sue (3 pp, 48.0 K) April 2007 Notice of intent to sue on behalf of Rocky Mountain Clean Air Action and Colorado Citizens Against Toxic Waste.
Civil Suit filed against EPA for failure to review/revise Subpart W in a timely fashion (12 pp, 118.1 K) August 2008
History of NESHAPS and Subpart W (14 pp, 107 K), September 2008 This document describes the history of the NESHAP rulemaking process.
Tailings Impoundment Technologies (21 pp, 187 K), September 2008 This document is a review of the history of tailings impoundments, along with current design methods.
Review of Method 115 (10 pp, 132 K), September 2008 This document is a review of the current method for radon sampling and analysis to determine if it is current. Recommended Procedures for Measuring Radon Fluxes from Disposal Sites for Residueal Radioactive Materials (38 pp, 990 K) March 1983 This document is a reference to the document above.
Radon Flux Measurements on Gardiner and Royster Phosphogypsum Piles Near Tampa and Mulberry (59 pp, 7 MB) January 1986 Appendix A of this document outlines procedures for fabricating the Method 115 flux equipment.
Quality Assurance Project Plan (22 pp, 1.13 MB), September 2008 This document describes the quality assurance procedures performed by SC&A on reports submitted to EPA.
2009 Settlement Agreement between EPA and Plaintiffs (8 pp, 317 K), September 2009 This settlement agreement defines terms and conditions for the Subpart W rulemaking effort between EPA and Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action.
November 3, 2009 letter to plaintiffs regarding settlement agreement (2 pp, 71 K) November 2009 Letter from DOJ to plaintiffs establishing date the settlement agreement became effective.
Colorado Citizens Against Toxic Waste concerns about Cotter Uranium Mill (58 pp, 3 MB) January 2010
EPA Contract number EP-D-10-042 (133 pp, 11.67 MB), March 2010 This document is the current contract between EPA Office of Radiation and Indoor Air and S. Cohen and Associates, signed March 24, 2010.

Work Plan for Risk Assessments (14 pp, 4.35 MB) May 2010 This document describes how S. Cohen & Associates will perform the risk assessment work at operating uranium facilities.
Uranium Mill Tailings Radon Flux Calculations (34 pp, 3.62 MB) August 2010
ATSDR Public Health Assessment for Lincoln Park/Cotter Uranium (212 pp, 5.80 MB) September 2010 Note this is a draft document. The comment period has ended. The final version will be posted when received.
Draft ATSDR Toxicological Profile for Uranium May 2011 (note this is a draft document, the comment period ends on July 29, 2011)
Comments by Steven H. Brown, CHP (12 pp, 1.81 MB) November 2010 EPA Review of Standards for Uranium and Thorium Milling Facilities @ 40 CFR Parts 61 and 192, by Steven H. Brown, CHP of SENES Consultants Limited.
November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings (80 pp, 2.02 MB) November 2011 This document revisits risk methods used for radon emissions from uranium recovery facilities.
Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings (40 pp, 661.40 K) November 2010 Task 5 - Radon Emission from Evaporation Ponds
Risk Assessment Model Selection Methodology (45 pp, 248 K) August 2010 This document shows the methodology used to determine the model for the revised Subpart W Risk Assessment.
Freedom of Information Act Request On May 11, 2011 EPA submitted a final response to a Freedom of Information Act Request regarding the on going review of radon emissions regulations at uranium recovery facilities and for information regarding regulation of radon emissions from the uranium mill in Canon City, CO. Two thousand three hundred and three (2,303) responsive e-mails were identified, including 2,065 un-redacted e-mails. If you would like a cd version of the responsive e-mails, please submit your request via the public participation link above.
Rio Tinto (842 pp, 87.1 MB) April 2012 Kennecott Uranium Company, Comments on the Review of 40 CFR 61 Subpart W
Uranium Watch (8 pp, 125.4 K) July 2013 This document contains comments on Subpart W from Uranium Watch.
Background Information Document Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking (128 pp, 2.24 MB) April 2014
2013 Domestic Uranium Report (24 pp, 322 K)
Email request for extension of comment period and request for public hearing. Letter from Sarah Fields 6-10-14 (PDF) (1 pp, 60K) Hearing Request (PDF) (2 pp, 57K)

Presentations

- NRC/NMA Uranium Recovery Workshop (12 pp, 256 K), May 2011
- National Mining Association 2008 (15 pp, 345 K), April 2008
- Canon City Colorado (20 pp, 236 K), June 2009
- National Mining Association 2009 (17 pp, 179 K), July 2009
- Rapid City South Dakota (22 pp, 128 K), October 2009
- National Mining Association (11 pp, 88 K), October 2009
- National Mining Association 2010 (16 pp, 163K) May 2010
- National Webinar (26 pp, 226 K), June 2010
- Tuba City Arizona Uranium Stakeholders (14 pp, 313 K) September 2010
- NRC's Uranium Recovery Licensing Workshop (24 pp, 2.72 MB) January 2011

- Sheep Mountain Uranium Project (82 pp, 12.46 MB) April 7, 2011
- Link to National Mining Association presentations.
- National Mining Association presentation "Experimental Determination of Radon Fluxes over Water" (22 pp, 516 K) May 2012
- This is a link to the Office of Management and Budget (OMB) website which documents a listening meeting between members of the National Mining Association and several federal organizations regarding Subpart W.

Uranium Recovery Workshop April 29 - 30, 2008

- Presentations Part 1 (91 pp, 822.97 K)
- Presentations Part 2 (121 pp, 2.37 MB)

Uranium Recovery Workshop July 1- 2, 2009

- Presentation Part 1 (72 pp, 4.08 MB)
- Presentation Part 2 (76 pp, 2.36 MB)
- Presentation Part 3 (107 pp, 653.65K)
- Presentation Part 4 (17 pp, 304 MB)

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Historical Rulemakings

April 6 1983 Proposed Rule (17 pp, 2.33 MB), April 1983
This is a 1983 proposal for regulating hazardous air pollutants.

40 CFR Part 61 192.32 a (2 pp, 287 K), October 1983
These are the operating standards for uranium recovery facilities (Subpart W).

October 31 1984 ANPR Radionuclides (13 pp, 1.85 MB), October 1984
This document is EPA's advance notice of a proposed rulemaking concerning radionuclides in 1984.

40 CFR Part 61 General Requirements (4 pp, 594 K), November 1985
These are the general operating and permitting requirements for NESHAP facilities.

Geotechnical & Geohydrological Aspects of Waste Management (3 pp, 428 K) February 1986
Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds.

Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings (224 pp, 6.25 MB), [EPA 520-1-86-009], August 1986
This is the background information used to make the determination on the Subpart W rule.

September 24 1986 Final Rule (13 pp, 3.17 MB), September 1986
This is a 1986 rule that establishes work practices at uranium tailings facilities.

Draft EIS Statement for Proposed NESHAPS for Radionuclides (260 pp, 7.76 MB), [EPA 520-1-89-005], February 1989
This document is a draft of the original 1989 environmental impact statement for the 1989 NESHAP rulemaking.

March 7 1989 Proposed Rule (58 pp, 8.19 MB). March 1989
This is a proposed rule for the NESHAP requirements.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (1) (278 pp, 12,433 K), [EPA 520-1-89-005], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (2) (378 pp, 27 MB), [EPA 520-1-89-006-2], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (3) (575 pp, 1 2MB), [EPA 520-1-89-007], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

December 15 1989 Final Rule (63 pp, 9.25 MB), December 1989
This is the final rule for regulating hazardous air pollutants using NESHAP.

Method 115 (3 pp, 443 K), December 1989
This is the monitoring method which must be used to determine radon emissions for Subpart W.

Subpart T Rescission (24 pp, 3.38 MB), December 1991
This document describes how EPA's uranium tailings disposal standards apply to the Department of Energy.

40 CFR Part 61 192.32 a Errata (1 pg, 131 K), November 1993
This rule replaces some language from the original operating standards for uranium recovery facilities (Subpart W).

40 CFR Part 61 General Requirements Errata (2 pp, 312 K), March 1994
This rule replaces some language from the original general operating and permitting requirements.

EPA Procedures for Determining Confidential Business Information (9 pp, 96.9 K), July 1995
This document describes the process EPA uses to determine if information is confidential business information, for purposes of the Freedom of Information Act (FOIA).

October 17 2000 Errata (1 pg, 127 K), October 2000
This document clarifies some test method and procedures language.

NRC's In-Situ Leach Facility Standard Review Plan (255 pp, 193 MB), June 2003
This NRC document provides guidance to NRC staff on reviewing applications to develop and operate uranium recovery facilities.

IAEA Uranium Mill Tailings Report (309 pp, 7.30 MB), August 2004
This document details international efforts to ensure long-term stabilization of uranium mill tailing.

EPA Contract number EP-D-05-002 (103 pp, 10.9 MB), November 2004
This document is the contract between EPA Office of Radiation and Indoor Air and S. Cohen and Associates. Note that this contract expires on March 26, 2010.

Construction of an Environmental Radon Monitoring System using CR-39 Nuclear Track Detectors (6 pp, 746. K) December 2004

Applications

Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility

- Cover Letter (2 pp, 74 K), August 2010
- Application for approval of construction (8 pp, 1.77 MB), August 2010
  - Attachment 1 Operating Plan (21 pp, 13.3 MB), August 2010
  - Attachment 2 Tailings Radon Flux (34 pp, 6.37MB), August 2010
  - Attachment 3 Tailings Cell Water Balance (50 pp, 5.17 MB), August 2010
  - Attachment 4 Tailings Cell Design Report (382 pp, 38.5 MB), August 2010
- Evaporation Pond Design Report (93 pp, 13.6 MB), October 2008
- Evaporation Ponds Radon Flux Analysis (30 pp, 511 K), August 2010
- Raffinate Characterization Pinon Ridge Mill (53 pp, 1.06 MB), August 2010

Enforcement

Section 114 Letters/Responses
These documents are EPA requests (with responses as they are received) for facility information from uranium recovery facilities

- Cogema Part 1 - October 8, 2008 Response (23 pp, 7.73 MB), October 2008
- Cogema Part 2 - November 14, 2008 Response (17 pp, 5.50 MB), November 2008
- Cogema request for Radon Flux Monitoring (10 pp, 2.44 MB)
- Uranium Highland (10 pp, 2.7 MB), February 2009
- Uranium Highland Response to Section 114 Letter (10 pp, 3,01 K), March 2009
- Cameco request for Radon Flux Monitoring (10 pp, 2.46 MB)
- Uranium Energy Solutions (10 pp, 2.37 MB), February 2009
- Uranium Energy Solutions Response to Section 114 Letter (10 pp, 3,167 K), March 2009
- Uranium Denison (10 pp, 2.33 MB), February 2009
- Denison Response to Section 114 Letter (26 pp, 1.25 MB)
- Denison request for Radon Flux Monitoring (12 pp, 2.57 MB)
- Uranium Cotter (10 pp, 2,529 K), May 2009
    - 2009-05-29 Cotter's Cover Letter (1p, 22.7 K)
    - 2009-05-29 Cotter's Request for Information (29 pp, 127.8 K)
    - 2009-05-28 Cotter's Document Index (5 pp, 33.9 K)
    - Attachment 1 (5 pp, 1.5 MB)
    - Attachment 1(a) (1pg, 147.1 K)
    - Attachment 1(b) (1pg, 368.8 K)
    - Attachment 1(c) (1pg, 360.6 K)
    - 2009-05-29 Cotter's response to EPA's request to test (2 pp, 41.4 K)
- Cotter request for Radon Flux Monitoring (10 pp, 2.47 MB)
- Mestena request for Radon Flux Monitoring (10 pp, 2.45 MB)
- Mestena response to request for Radon Flux Monitoring (1p, 248.8 K)
- Crow Butte request for Radon Flux Monitoring (10 pp, 2.44 MB)

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Useful Links

- EPA's Rad-NESHAP Home page
- EPA's TENORM Home Page
- EPA's Radon Home Page
- EPA Radiation Protection Risk Assessment Home Page
- EPA's Risk Assessment for toxic air pollutants: A citizens guide
- EPA's Superfund Home Page
- EPA's Home Page for Environmental Justice Issues
- EPA's American Indian Environmental Office Home Page
- Home page of the Nuclear Regulatory Commission
- Home page of the Department of Energy
- How EPA writes regulations

Mine Location Database

EPA worked with the multi-agency Colorado Plateau Data Coordination Group Steering Committee to develop a geographic information database on uranium mines and mills. (The Agency also coordinated this effort with federal, state, and tribal agencies in other parts of the western U.S.)

The database identifies and shows the location of active and inactive uranium mines and mills, as well as mines which principally produced other minerals, but were known to have uranium in the ore. The database covers mine locations in fourteen western states. It also contains other information about the sites. Originally compiled as an important component of the uranium mining technical reports currently being developed, the database was reviewed and checked for its quality to eliminate duplicate and erroneous sites, and subjected to EPA’s scientific peer review process.

The database and descriptive materials about its content are now available.

Contact Information

Reid Rosnick, Chair
202-343-9563

⇧Top of page

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:13 PM
To: Thornton, Marisa
Subject: FW: Couple of real quick changes to the Subpart W page
Attachments: rulemaking-activity.html

From: Romero, Carmen
Sent: Monday, June 16, 2014 2:36 PM
To: Nesky, Anthony
Cc: Herrenbruck, Glenna
Subject: RE: Couple of real quick changes to the Subpart W page

Here is the updated file to post.

From: Nesky, Anthony
Sent: Monday, June 16, 2014 2:08 PM
To: Romero, Carmen
Cc: Herrenbruck, Glenna
Subject: Couple of real quick changes to the Subpart W page

Dear Carmen:

Thanks for turning this around so quickly:
Here are a couple of quick changes

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Under "on this page:
Please add jumps to

- Request for a Public Hearing
- Requests for Extension for the Public Comment Period.

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In the last sentence, "EPA plans to extend the public comment period." Please hyperlilnk "extend the public comment period" to the jump to "Requests for a Public Hearing."

Please call if you have any questions. Thanks for your help!

Tony Nesky
Center for Radiation Information and Outreach

Tel: 202-343-9597
nesky.tony@epa.gov

From: Romero, Carmen
Sent: Monday, June 16, 2014 12:35 PM
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Cc: Herrenbruck, Glenna; Rosnick, Reid
Subject: RE: Missing Document for the Subpart W

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Carmen

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Cc: Herrenbruck, Glenna; Rosnick, Reid
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  Author: EPA-OAR-ORIA-RPD
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, hearing request.

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On:
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- Memo to Docket on Telephone Request for Public Hearing (PDF
- Letter from Uranium Watch(PDF…)

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  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, hearing request.

- *File: Uranium WatchExtensionRequest-6-12-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, comment period extension request.

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:15 PM
To: Thornton, Marisa
Subject: FW: Draft Agenda for the NTAA/EPA Policy Call

From: Harrison, Jed
Sent: Monday, June 16, 2014 1:41 PM
To: Andy Bessler; Rosnick, Reid
Cc: Colon, Toni
Subject: RE: Draft Agenda for the NTAA/EPA Policy Call

Hi Andy-

I forwarded your earlier. request for a description to Reid. This looks fine to me, but I'll defer to Reid.

Jed

Jed Harrison SENIOR ADVISOR FOR TRIBAL AFFAIRS
U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RADIATION & INDOOR AIR
(702) 784 8218 MOBILE: (702) 494 7050

4220 S. MARYLAND PARKWAY
BLDG. D, SUITE 800
LAS VEGAS, NEVADA 89119

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Monday, June 16, 2014 10:39 AM
To: Harrison, Jed; Rosnick, Reid
Cc: Colon, Toni
Subject: Draft Agenda for the NTAA/EPA Policy Call

Hello Reid and Jed:

Please take a look at that attached draft agenda and let me know what changes you would like to see. Feel free to scrap it and send me another paragraph summarizing your presentation and offering a web link for more information.

I put down 30 minutes that includes time for Q and A.

Let me know if you have any questions!

Andy

Andy Bessler
Project Director
NTAA
National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:14 PM
To: Thornton, Marisa
Subject: FW: Couple of real quick changes to the Subpart W page

Importance: High

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Follow Up Flag:	Follow up
Flag Status:	Flagged

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Andy Bessler
Project Director
N T A A
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P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

http://www.epa.gov/radiation/docs/neshaps/subpart-w/neshap_subpart-w_npr-final_-prepublication.pdf

3. **EPA Air Updates – (OAR, OAQPS, OTAQ, ORIA, OAP)**

4. **NTAA Updates – Bill Thompson, NTAA Chairman**

The next NTAA/EPA Policy call will be on
July 31st, 2014 at 12:00 Noon Mountain Time

Thornton, Marisa

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Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: We have to make some changes to the Subpart W page today
Importance: High

Cara Carmen,
We have some changes to the Subpart W page that will need to be posted today. Please post to the staging server so that all parties can review before we finalize.
On:
http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html
Please add the following two sections before the section "EPA is proposing revisions to Subpart W."

Requests for a Public Hearing
EPA has received two requests for a public hearing on the proposed rulemaking for NESHAP Subpart W. EPA plans to conduct a public hearing in response to these requests. The Agency is currently planning the public hearing and will post the information regarding the public hearing (dates, location, times, registration information, etc.) on this website as soon as it has been finalized. Interested parties should check this website for updates.
Requests for a public hearing—

- Memo to Docket on Telephone Request for Public Hearing (PDF
- Letter from Uranium Watch(PDF…)

Requests for Extension of the Public Comment Period
EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension

of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.

Requests for an extension of the public comment period—

- Request from Uranium Watch (PDF….)
- Request from NTAA (PDF..)

Note to Carment All of the PDF files for the above are attached, except for the Memo to the Docket, which I am still working on.

Metadata for the PDF files are as follows--

- *File: Uranium WatchHearingRequest-6-10-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, hearing request.

- *File: Uranium WatchExtensionRequest-6-12-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, comment period extension request.

- *File: NTAA_CommentExtReq_SubpartWRule*

  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: NTAA
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, comment period extension request.

After inserting the two sections above, please change the next section as follows--

EPA is proposing revisions to Subpart W. Comment period is open.

"National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. The docket (EPA-HQ-OAR-2008-0218) for this proposed rulemaking may be accessed at Regulations.gov. Once in the docket, you can view the proposed rule and supporting documents . The public comment period currently ends on July 31, 2014 . EPA plans to extend the public comment period

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

www.ntaatribalair.org
928.523.0526 office
928.523.1266 fax

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004

June 13, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air
Radiation Protection Division
U.S. Environmental Protection Agency
Via email to rosnick.reid@epa.gov

Dear Mr. Rosnick,

The National Tribal Air Association (NTAA) is an autonomous organization with 80 principal member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of Indian Tribes. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions.

On behalf of the NTAA, I am writing to request that EPA extend the public comment period for the proposed rule issued in the Federal Register on May 2, 2014, which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings*". Specifically, the *NTAA is requesting the maximum comment extension period of 120 days*.

This rule addresses both conventional uranium milling operations as well as future extraction activities, namely in-situ leach/recovery (ISL) sites. Domestic uranium milling and mining operations to date have left in their wake a disturbing legacy of environmental injustice in Indian Country. As a national organization whose mission it is to advance air quality management and policies for federally recognized Tribes, it is only prudent that NTAA thoroughly evaluate the consequences of the proposed rule, including the potential impacts on Tribal communities, and subsequently provide comments to EPA. Given the serious complexity of the proposed rule, as well as the wide ranging implications for affected Tribes, we strongly request that you grant the aforementioned extension.

For our part, NTAA was only made aware of the proposed rule within the last two weeks. The public comment extension will help to promote a just and equitable public participation process by giving the NTAA, member Tribes, and those Tribes indicated on EPA's consultation list adequate time to examine the complex science and the associated human health considerations embodied in the proposed rule.

Sincerely,

Bill Thompson
Chairman, NTAA

Memo to: EPA Docket (EPA-HQ-OAR-2008-0218)

From: Anthony Nesky, EPA/OAR/ORIA/RPD

Subject: Request for a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule."

On June 10, 2014, Jennifer Thurston of INFORM Colorado called Anthony Nesky of the EPA Radiation Protection Division (RPD) in the Office of Radiation and Indoor Air (ORIA), in the Office of Air and Radiation (OAR), at the U.S. Environmental Protection Agency (EPA) to request a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule," 79 Fed. Reg. 25,388 (May 2, 2014), which proposes revisions to 40 CFR Part 61, Subpart W. Ms. Thurston explained that she was requesting the public hearing on behalf of a number of organizations who wanted public hearings in multiple locations.

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick:

REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

Uranium Watch requests a 60-day extension of the time period to submit comments on the Environmental Protection Agency's (EPA's) Proposed Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings, 49 C.F.R. Part 61 Subpart W, Docket ID No. EPA–HQ– OAR–2008–0218. 79 Fed. Reg. 25388, May 2, 2014.

The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

This incorrect factual claim regarding the Shootaring Canyon Mill and other misinformation, misleading information, incomplete information, and outdated information require a commenter to carefully review the proposed rule and supporting documents. Also, the EPA has asked for commenters' thoughts on various aspects of the proposed rule. These lengthy and detailed research and comment preparations require additional time in order to frame informed comments.

REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

Thank you for consideration of this request.

Sincerely,

Sarah Fields
sarah@uraniumwatch.org

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[1] http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

From: sarah@uraniumwatch.org
Sent: Thursday, June 12, 2014 3:52 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Group A-AND-R-DOCKET
Subject: Amended Hearing Request and Request for Records

Dear Mr. Rosnick,

This is to amend my request for extension of time for the public to submit comments on the 40 CFR Part 16 Subpart W Rulemaking. I request a 120-day extension of time.

I have also realized that there are no Section 114 Letters/Responses for facility information for the Kennecott Sweetwater Mill. If the EPA is going to make assertions regarding the Sweetwater Mill, the documentation to support those assertions must be available to the public on the Rulemaking Docket and EPA Subpart W webpage.

Also, the EPA Background Information Document and the Risk Assessments refer to various other documents. However, there is scant information regarding public access to these records, and the EPA has not posted these documents to the EPA Subpart W Website.

A 120-day extension of time to submit comments will give the EPA time to request pertinent information from Uranium One, Energy Fuels, and Kennecott and make those responses and the documents referenced in the BID and Rick Assessments available to the public and for the public to review the documents in order to frame comments.

Thank you for your consideration of this request,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84533
435-260-8384

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Subpart W Rulemaking Activity

Get e-mail updates when this information changes.

NESHAP Subpart W is a radon emission standard for operating uranium mill tailings. In accordance with the Clean Air Act Amendments of 1990, EPA formed a workgroup to review the standard.

EPA will provide up-to-date information on recent or upcoming conference calls, resources, public hearings and contact information. Please check back regularly, as more items will be added.

On this page:

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- Memo to Docket on Telephone Request for Public Hearing (PDF) (1 pp, 196 KB About PDF)
- Letter from Uranium Watch (PDF) (1 pp, 42.9 KB About PDF)

Requests for Extension of the Public Comment Period

EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.

- Request from Uranium Watch (PDF) (2 pp, 58.9 KB About PDF)

- Request from NTAA (PDF) (1 pp, 32.4 KB About PDF)

EPA is proposing revisions to Subpart W. Comment period is open.

"National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. The docket (EPA-HQ-OAR-2008-0218) for this proposed rulemaking may be accessed at Regulations.gov. Once in the docket, you can view the proposed rule and supporting documents. The public comment period currently ends on July 31, 2014. EPA plans to extend the public comment period.

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

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Download the Proposed Rule and Submit Comments on Line

- Notice of Proposed Rulemaking from theFederal Register.
- Fact Sheet on the Proposed Rule (2 pp, 52 K, About PDF)
- Submit Comments on line at Regulations.gov (Note: Comments may also be submitted by mail, see the Notice of Proposed Rulemaking for instructions)

Conference Call Information

EPA will hold quarterly conference calls with interested stakeholders. The next conference call will occur on **Thursday, July 3, 2014 at 11 AM EDT, 10am CDT, 9am MDT and 8am PDT. The call in number is 1-866-299-3188.** You will be prompted for a conference code, which will be 2023439563. After entering the conference code press the # key and you will then be placed into the conference call.

Year	1st Quarter January - March	2nd Quarter April - June	3rd Quarter July - September	4th Quarter October - December
2009				Minutes from December 3, 2009 conference call.
2010	Minutes from January 5, 2010 conference call.	Minutes from April 6, 2010 conference call.	Minutes from July 6, 2010 conference call.	Minutes from October 5, 2010 conference call.
2011	Minutes from January 5, 2011 conference call.	Minutes from April 7, 2011 conference call.	Minutes from July 7, 2011 conference call.	Minutes from October 6, 2011 conference call.
2012	Minutes from January 5, 2012 conference call.	Minutes from April 5, 2012 conference call.	Minutes from July 5, 2012 conference call.	Minutes from October 4, 2012 conference call.
2013	Minutes from January 3, 2013 conference call.	Minutes from April 3, 2013 conference call.	Minutes from July 11, 2013 conference call.	Minutes from October 17, 2013 conference call.

2014	Minutes from January 2, 2014 conference call.	Minutes from April 3, 2014 conference call.

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Documents

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Current Action

April 26, 2007 Notice of Intent to sue (3 pp, 48.0 K) April 2007
Notice of intent to sue on behalf of Rocky Mountain Clean Air Action and Colorado Citizens Against Toxic Waste.

Civil Suit filed against EPA for failure to review/revise Subpart W in a timely fashion (12 pp, 118.1 K) August 2008

History of NESHAPS and Subpart W (14 pp, 107 K), September 2008
This document describes the history of the NESHAP rulemaking process.

Tailings Impoundment Technologies (21 pp, 187 K), September 2008
This document is a review of the history of tailings impoundments, along with current design methods.

Review of Method 115 (10 pp, 132 K), September 2008
This document is a review of the current method for radon sampling and analysis to determine if it is current.

> Recommended Procedures for Measuring Radon Fluxes from Disposal Sites for Residueal Radioactive Materials (38 pp, 990 K) March 1983
> This document is a reference to the document above.

Radon Flux Measurements on Gardiner and Royster Phosphogypsum Piles Near Tampa and Mulberry (59 pp, 7 MB) January 1986
Appendix A of this document outlines procedures for fabricating the Method 115 flux equipment.

Quality Assurance Project Plan (22 pp, 1.13 MB), September 2008
This document describes the quality assurance procedures performed by SC&A on reports submitted to EPA.

2009 Settlement Agreement between EPA and Plaintiffs (8 pp, 317 K), September 2009
This settlement agreement defines terms and conditions for the Subpart W rulemaking effort between EPA and Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action.

November 3, 2009 letter to plaintiffs regarding settlement agreement (2 pp, 71 K) November 2009
Letter from DOJ to plaintiffs establishing date the settlement agreement became effective.

Colorado Citizens Against Toxic Waste concerns about Cotter Uranium Mill (58 pp, 3 MB) January 2010

EPA Contract number EP-D-10-042 (133 pp, 11.67 MB), March 2010
This document is the current contract between EPA Office of Radiation and Indoor Air and S. Cohen and Associates, signed March 24, 2010.

Work Plan for Risk Assessments (14 pp, 4.35 MB) May 2010 This document describes how S. Cohen & Associates will perform the risk assessment work at operating uranium facilities.
Uranium Mill Tailings Radon Flux Calculations (34 pp, 3.62 MB) August 2010
ATSDR Public Health Assessment for Lincoln Park/Cotter Uranium (212 pp, 5.80 MB) September 2010 Note this is a draft document. The comment period has ended. The final version will be posted when received.
Draft ATSDR Toxicological Profile for Uranium May 2011 (note this is a draft document, the comment period ends on July 29, 2011)
Comments by Steven H. Brown, CHP (12 pp, 1.81 MB) November 2010 EPA Review of Standards for Uranium and Thorium Milling Facilities @ 40 CFR Parts 61 and 192, by Steven H. Brown, CHP of SENES Consultants Limited.
November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings (80 pp, 2.02 MB) November 2011 This document revisits risk methods used for radon emissions from uranium recovery facilities.
Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings (40 pp, 661.40 K) November 2010 Task 5 - Radon Emission from Evaporation Ponds
Risk Assessment Model Selection Methodology (45 pp, 248 K) August 2010 This document shows the methodology used to determine the model for the revised Subpart W Risk Assessment.
Freedom of Information Act Request On May 11, 2011 EPA submitted a final response to a Freedom of Information Act Request regarding the on going review of radon emissions regulations at uranium recovery facilities and for information regarding regulation of radon emissions from the uranium mill in Canon City, CO. Two thousand three hundred and three (2,303) responsive e-mails were identified, including 2,065 un-redacted e-mails. If you would like a cd version of the responsive e-mails, please submit your request via the public participation link above.
Rio Tinto (842 pp, 87.1 MB) April 2012 Kennecott Uranium Company, Comments on the Review of 40 CFR 61 Subpart W
Uranium Watch (8 pp, 125.4 K) July 2013 This document contains comments on Subpart W from Uranium Watch.
Background Information Document Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking (128 pp, 2.24 MB) April 2014
2013 Domestic Uranium Report (24 pp, 322 K)
Email request for extension of comment period and request for public hearing. Letter from Sarah Fields 6-10-14 (PDF) (1 pp, 60K) Hearing Request (PDF) (2 pp, 57K)

Presentations

- NRC/NMA Uranium Recovery Workshop (12 pp, 256 K), May 2011
- National Mining Association 2008 (15 pp, 345 K), April 2008
- Canon City Colorado (20 pp, 236 K), June 2009
- National Mining Association 2009 (17 pp, 179 K), July 2009
- Rapid City South Dakota (22 pp, 128 K), October 2009
- National Mining Association (11 pp, 88 K), October 2009
- National Mining Association 2010 (16 pp, 163K) May 2010
- National Webinar (26 pp, 226 K), June 2010
- Tuba City Arizona Uranium Stakeholders (14 pp, 313 K) September 2010
- NRC's Uranium Recovery Licensing Workshop (24 pp, 2.72 MB) January 2011

- Sheep Mountain Uranium Project (82 pp, 12.46 MB) April 7, 2011
- Link to National Mining Association presentations.
- National Mining Association presentation "Experimental Determination of Radon Fluxes over Water" (22 pp, 516 K) May 2012
- This is a link to the Office of Management and Budget (OMB) website which documents a listening meeting between members of the National Mining Association and several federal organizations regarding Subpart W.

Uranium Recovery Workshop April 29 - 30, 2008

- Presentations Part 1 (91 pp, 822.97 K)
- Presentations Part 2 (121 pp, 2.37 MB)

Uranium Recovery Workshop July 1- 2, 2009

- Presentation Part 1 (72 pp, 4.08 MB)
- Presentation Part 2 (76 pp, 2.36 MB)
- Presentation Part 3 (107 pp, 653.65K)
- Presentation Part 4 (17 pp, 304 MB)

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Historical Rulemakings

April 6 1983 Proposed Rule (17 pp, 2.33 MB), April 1983
This is a 1983 proposal for regulating hazardous air pollutants.

40 CFR Part 61 192.32 a (2 pp, 287 K), October 1983
These are the operating standards for uranium recovery facilities (Subpart W).

October 31 1984 ANPR Radionuclides (13 pp, 1.85 MB), October 1984
This document is EPA's advance notice of a proposed rulemaking concerning radionuclides in 1984.

40 CFR Part 61 General Requirements (4 pp, 594 K), November 1985
These are the general operating and permitting requirements for NESHAP facilities.

Geotechnical & Geohydrological Aspects of Waste Management (3 pp, 428 K) February 1986
Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds.

Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings (224 pp, 6.25 MB), [EPA 520-1-86-009], August 1986
This is the background information used to make the determination on the Subpart W rule.

September 24 1986 Final Rule (13 pp, 3.17 MB), September 1986
This is a 1986 rule that establishes work practices at uranium tailings facilities.

Draft EIS Statement for Proposed NESHAPS for Radionuclides (260 pp, 7.76 MB), [EPA 520-1-89-005], February 1989
This document is a draft of the original 1989 environmental impact statement for the 1989 NESHAP rulemaking.

March 7 1989 Proposed Rule (58 pp, 8.19 MB). March 1989
This is a proposed rule for the NESHAP requirements.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (1) (278 pp, 12,433 K), [EPA 520-1-89-005], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (2) (378 pp, 27 MB), [EPA 520-1-89-006-2], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (3) (575 pp, 1 2MB), [EPA 520-1-89-007], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

December 15 1989 Final Rule (63 pp, 9.25 MB), December 1989
This is the final rule for regulating hazardous air pollutants using NESHAP.

Method 115 (3 pp, 443 K), December 1989
This is the monitoring method which must be used to determine radon emissions for Subpart W.

Subpart T Rescission (24 pp, 3.38 MB), December 1991
This document describes how EPA's uranium tailings disposal standards apply to the Department of Energy.

40 CFR Part 61 192.32 a Errata (1 pg, 131 K), November 1993
This rule replaces some language from the original operating standards for uranium recovery facilities (Subpart W).

40 CFR Part 61 General Requirements Errata (2 pp, 312 K), March 1994
This rule replaces some language from the original general operating and permitting requirements.

EPA Procedures for Determining Confidential Business Information (9 pp, 96.9 K), July 1995
This document describes the process EPA uses to determine if information is confidential business information, for purposes of the Freedom of Information Act (FOIA).

October 17 2000 Errata (1 pg, 127 K), October 2000
This document clarifies some test method and procedures language.

NRC's In-Situ Leach Facility Standard Review Plan (255 pp, 193 MB), June 2003
This NRC document provides guidance to NRC staff on reviewing applications to develop and operate uranium recovery facilities.

IAEA Uranium Mill Tailings Report (309 pp, 7.30 MB), August 2004
This document details international efforts to ensure long-term stabilization of uranium mill tailing.

EPA Contract number EP-D-05-002 (103 pp, 10.9 MB), November 2004
This document is the contract between EPA Office of Radiation and Indoor Air and S. Cohen and Associates. Note that this contract expires on March 26, 2010.

Construction of an Environmental Radon Monitoring System using CR-39 Nuclear Track Detectors (6 pp, 746. K) December 2004

Applications

Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility

- Cover Letter (2 pp, 74 K), August 2010
- Application for approval of construction (8 pp, 1.77 MB), August 2010
    - Attachment 1 Operating Plan (21 pp, 13.3 MB), August 2010
    - Attachment 2 Tailings Radon Flux (34 pp, 6.37MB), August 2010
    - Attachment 3 Tailings Cell Water Balance (50 pp, 5.17 MB), August 2010
    - Attachment 4 Tailings Cell Design Report (382 pp, 38.5 MB), August 2010
- Evaporation Pond Design Report (93 pp, 13.6 MB), October 2008
- Evaporation Ponds Radon Flux Analysis (30 pp, 511 K), August 2010
- Raffinate Characterization Pinon Ridge Mill (53 pp, 1.06 MB), August 2010

Enforcement

Section 114 Letters/Responses
These documents are EPA requests (with responses as they are received) for facility information from uranium recovery facilities

- Cogema Part 1 - October 8, 2008 Response (23 pp, 7.73 MB), October 2008
- Cogema Part 2 - November 14, 2008 Response (17 pp, 5.50 MB), November 2008
- Cogema request for Radon Flux Monitoring (10 pp, 2.44 MB)
- Uranium Highland (10 pp, 2.7 MB), February 2009
- Uranium Highland Response to Section 114 Letter (10 pp, 3,01 K), March 2009
- Cameco request for Radon Flux Monitoring (10 pp, 2.46 MB)
- Uranium Energy Solutions (10 pp, 2.37 MB), February 2009
- Uranium Energy Solutions Response to Section 114 Letter (10 pp, 3,167 K), March 2009
- Uranium Denison (10 pp, 2.33 MB), February 2009
- Denison Response to Section 114 Letter (26 pp, 1.25 MB)
- Denison request for Radon Flux Monitoring (12 pp, 2.57 MB)
- Uranium Cotter (10 pp, 2,529 K), May 2009
    - 2009-05-29 Cotter's Cover Letter (1p, 22.7 K)
    - 2009-05-29 Cotter's Request for Information (29 pp, 127.8 K)
    - 2009-05-28 Cotter's Document Index (5 pp, 33.9 K)
    - Attachment 1 (5 pp, 1.5 MB)
    - Attachment 1(a) (1pg, 147.1 K)
    - Attachment 1(b) (1pg, 368.8 K)
    - Attachment 1(c) (1pg, 360.6 K)
    - 2009-05-29 Cotter's response to EPA's request to test (2 pp, 41.4 K)
- Cotter request for Radon Flux Monitoring (10 pp, 2.47 MB)
- Mestena request for Radon Flux Monitoring (10 pp, 2.45 MB)
- Mestena response to request for Radon Flux Monitoring (1p, 248.8 K)
- Crow Butte request for Radon Flux Monitoring (10 pp, 2.44 MB)

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Useful Links

- EPA's Rad-NESHAP Home page
- EPA's TENORM Home Page
- EPA's Radon Home Page
- EPA Radiation Protection Risk Assessment Home Page
- EPA's Risk Assessment for toxic air pollutants: A citizens guide
- EPA's Superfund Home Page
- EPA's Home Page for Environmental Justice Issues
- EPA's American Indian Environmental Office Home Page
- Home page of the Nuclear Regulatory Commission
- Home page of the Department of Energy
- How EPA writes regulations

Mine Location Database

EPA worked with the multi-agency Colorado Plateau Data Coordination Group Steering Committee to develop a geographic information database on uranium mines and mills. (The Agency also coordinated this effort with federal, state, and tribal agencies in other parts of the western U.S.)

The database identifies and shows the location of active and inactive uranium mines and mills, as well as mines which principally produced other minerals, but were known to have uranium in the ore. The database covers mine locations in fourteen western states. It also contains other information about the sites. Originally compiled as an important component of the uranium mining technical reports currently being developed, the database was reviewed and checked for its quality to eliminate duplicate and erroneous sites, and subjected to EPA's scientific peer review process.

The database and descriptive materials about its content are now available.

Contact Information

Reid Rosnick, Chair
202-343-9563

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Subpart W Rulemaking Activity

Get e-mail updates when this information changes.

NESHAP Subpart W is a radon emission standard for operating uranium mill tailings. In accordance with the Clean Air Act Amendments of 1990, EPA formed a workgroup to review the standard.

EPA will provide up-to-date information on recent or upcoming conference calls, resources, public hearings and contact information. Please check back regularly, as more items will be added.

On this page:

- Proposed Rule
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Rad NESHAPs

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Requests for a Public Hearing

EPA has received two requests for a public hearing on the proposed rulemaking for NESHAP Subpart W. EPA plans to conduct a public hearing in response to these requests. The Agency is currently planning the public hearing and will post the information regarding the public hearing (dates, location, times, registration information, etc.) on this website as soon as it has been finalized. Interested parties should check this website for updates.

- Memo to Docket on Telephone Request for Public Hearing (PDF) (1 pp, 196 KB About PDF)
- Letter from Uranium Watch (PDF) (1 pp, 42.9 KB About PDF)

Requests for Extension of the Public Comment Period

EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.

- Request from Uranium Watch (PDF) (2 pp, 58.9 KB About PDF)

- Request from NTAA (PDF) (1 pp, 32.4 KB About PDF)

EPA is proposing revisions to Subpart W. Comment period is open.

"National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. The docket (EPA-HQ-OAR-2008-0218) for this proposed rulemaking may be accessed at Regulations.gov. Once in the docket, you can view the proposed rule and supporting documents. The public comment period currently ends on July 31, 2014. EPA plans to extend the public comment period.

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343-9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our website at http://www.epa.gov/radiation.

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Download the Proposed Rule and Submit Comments on Line

- Notice of Proposed Rulemaking from theFederal Register.
- Fact Sheet on the Proposed Rule (2 pp, 52 K, About PDF)
- Submit Comments on line at Regulations.gov (Note: Comments may also be submitted by mail, see the Notice of Proposed Rulemaking for instructions)

Conference Call Information

EPA will hold quarterly conference calls with interested stakeholders. The next conference call will occur on **Thursday, July 3, 2014 at 11 AM EDT, 10am CDT, 9am MDT and 8am PDT. The call in number is 1-866-299-3188.** You will be prompted for a conference code, which will be 2023439563. After entering the conference code press the # key and you will then be placed into the conference call.

Year	1st Quarter January - March	2nd Quarter April - June	3rd Quarter July - September	4th Quarter October - December
2009				Minutes from December 3, 2009 conference call.
2010	Minutes from January 5, 2010 conference call.	Minutes from April 6, 2010 conference call.	Minutes from July 6, 2010 conference call.	Minutes from October 5, 2010 conference call.
2011	Minutes from January 5, 2011 conference call.	Minutes from April 7, 2011 conference call.	Minutes from July 7, 2011 conference call.	Minutes from October 6, 2011 conference call.
2012	Minutes from January 5, 2012 conference call.	Minutes from April 5, 2012 conference call.	Minutes from July 5, 2012 conference call.	Minutes from October 4, 2012 conference call.
2013	Minutes from January 3, 2013 conference call.	Minutes from April 3, 2013 conference call.	Minutes from July 11, 2013 conference call.	Minutes from October 17, 2013 conference call.

2014	Minutes from January 2, 2014 conference call.	Minutes from April 3, 2014 conference call.

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Documents

You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Current Action
April 26, 2007 Notice of Intent to sue (3 pp, 48.0 K) April 2007 Notice of intent to sue on behalf of Rocky Mountain Clean Air Action and Colorado Citizens Against Toxic Waste.
Civil Suit filed against EPA for failure to review/revise Subpart W in a timely fashion (12 pp, 118.1 K) August 2008
History of NESHAPS and Subpart W (14 pp, 107 K), September 2008 This document describes the history of the NESHAP rulemaking process.
Tailings Impoundment Technologies (21 pp, 187 K), September 2008 This document is a review of the history of tailings impoundments, along with current design methods.
Review of Method 115 (10 pp, 132 K), September 2008 This document is a review of the current method for radon sampling and analysis to determine if it is current. Recommended Procedures for Measuring Radon Fluxes from Disposal Sites for Resideual Radioactive Materials (38 pp, 990 K) March 1983 This document is a reference to the document above.
Radon Flux Measurements on Gardiner and Royster Phosphogypsum Piles Near Tampa and Mulberry (59 pp, 7 MB) January 1986 Appendix A of this document outlines procedures for fabricating the Method 115 flux equipment.
Quality Assurance Project Plan (22 pp, 1.13 MB), September 2008 This document describes the quality assurance procedures performed by SC&A on reports submitted to EPA.
2009 Settlement Agreement between EPA and Plaintiffs (8 pp, 317 K), September 2009 This settlement agreement defines terms and conditions for the Subpart W rulemaking effort between EPA and Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action.
November 3, 2009 letter to plaintiffs regarding settlement agreement (2 pp, 71 K) November 2009 Letter from DOJ to plaintiffs establishing date the settlement agreement became effective.
Colorado Citizens Against Toxic Waste concerns about Cotter Uranium Mill (58 pp, 3 MB) January 2010
EPA Contract number EP-D-10-042 (133 pp, 11.67 MB), March 2010 This document is the current contract between EPA Office of Radiation and Indoor Air and S. Cohen and Associates, signed March 24, 2010.

Work Plan for Risk Assessments (14 pp, 4.35 MB) May 2010 This document describes how S. Cohen & Associates will perform the risk assessment work at operating uranium facilities.
Uranium Mill Tailings Radon Flux Calculations (34 pp, 3.62 MB) August 2010
ATSDR Public Health Assessment for Lincoln Park/Cotter Uranium (212 pp, 5.80 MB) September 2010 Note this is a draft document. The comment period has ended. The final version will be posted when received.
Draft ATSDR Toxicological Profile for Uranium May 2011 (note this is a draft document, the comment period ends on July 29, 2011)
Comments by Steven H. Brown, CHP (12 pp, 1.81 MB) November 2010 EPA Review of Standards for Uranium and Thorium Milling Facilities @ 40 CFR Parts 61 and 192, by Steven H. Brown, CHP of SENES Consultants Limited.
November 10, 2011 Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings (80 pp, 2.02 MB) November 2011 This document revisits risk methods used for radon emissions from uranium recovery facilities.
Risk Assessment Revision for 40 CFR Part 61 Subpart W - Radon Emissions from Operating Mill Tailings (40 pp, 661.40 K) November 2010 Task 5 - Radon Emission from Evaporation Ponds
Risk Assessment Model Selection Methodology (45 pp, 248 K) August 2010 This document shows the methodology used to determine the model for the revised Subpart W Risk Assessment.
Freedom of Information Act Request On May 11, 2011 EPA submitted a final response to a Freedom of Information Act Request regarding the on going review of radon emissions regulations at uranium recovery facilities and for information regarding regulation of radon emissions from the uranium mill in Canon City, CO. Two thousand three hundred and three (2,303) responsive e-mails were identified, including 2,065 un-redacted e-mails. If you would like a cd version of the responsive e-mails, please submit your request via the public participation link above.
Rio Tinto (842 pp, 87.1 MB) April 2012 Kennecott Uranium Company, Comments on the Review of 40 CFR 61 Subpart W
Uranium Watch (8 pp, 125.4 K) July 2013 This document contains comments on Subpart W from Uranium Watch.
Background Information Document Economic Impact Analysis in Support of the Subpart W Proposed Rulemaking (128 pp, 2.24 MB) April 2014
2013 Domestic Uranium Report (24 pp, 322 K)
Email request for extension of comment period and request for public hearing. Letter from Sarah Fields 6-10-14 (PDF) (1 pp, 60K) Hearing Request (PDF) (2 pp, 57K)

Presentations

- NRC/NMA Uranium Recovery Workshop (12 pp, 256 K), May 2011
- National Mining Association 2008 (15 pp, 345 K), April 2008
- Canon City Colorado (20 pp, 236 K), June 2009
- National Mining Association 2009 (17 pp, 179 K), July 2009
- Rapid City South Dakota (22 pp, 128 K), October 2009
- National Mining Association (11 pp, 88 K), October 2009
- National Mining Association 2010 (16 pp, 163K) May 2010
- National Webinar (26 pp, 226 K), June 2010
- Tuba City Arizona Uranium Stakeholders (14 pp, 313 K) September 2010
- NRC's Uranium Recovery Licensing Workshop (24 pp, 2.72 MB) January 2011

- Sheep Mountain Uranium Project (82 pp, 12.46 MB) April 7, 2011
- Link to National Mining Association presentations.
- National Mining Association presentation "Experimental Determination of Radon Fluxes over Water" (22 pp, 516 K) May 2012
- This is a link to the Office of Management and Budget (OMB) website which documents a listening meeting between members of the National Mining Association and several federal organizations regarding Subpart W.

Uranium Recovery Workshop April 29 - 30, 2008

- Presentations Part 1 (91 pp, 822.97 K)
- Presentations Part 2 (121 pp, 2.37 MB)

Uranium Recovery Workshop July 1- 2, 2009

- Presentation Part 1 (72 pp, 4.08 MB)
- Presentation Part 2 (76 pp, 2.36 MB)
- Presentation Part 3 (107 pp, 653.65K)
- Presentation Part 4 (17 pp, 304 MB)

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Historical Rulemakings

April 6 1983 Proposed Rule (17 pp, 2.33 MB), April 1983
This is a 1983 proposal for regulating hazardous air pollutants.

40 CFR Part 61 192.32 a (2 pp, 287 K), October 1983
These are the operating standards for uranium recovery facilities (Subpart W).

October 31 1984 ANPR Radionuclides (13 pp, 1.85 MB), October 1984
This document is EPA's advance notice of a proposed rulemaking concerning radionuclides in 1984.

40 CFR Part 61 General Requirements (4 pp, 594 K), November 1985
These are the general operating and permitting requirements for NESHAP facilities.

Geotechnical & Geohydrological Aspects of Waste Management (3 pp, 428 K) February 1986
Surface water hydrology considerations in predicting radon releases from water-covered areas of uranium tailings ponds.

Background Information Document for Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings (224 pp, 6.25 MB), [EPA 520-1-86-009], August 1986
This is the background information used to make the determination on the Subpart W rule.

September 24 1986 Final Rule (13 pp, 3.17 MB), September 1986
This is a 1986 rule that establishes work practices at uranium tailings facilities.

Draft EIS Statement for Proposed NESHAPS for Radionuclides (260 pp, 7.76 MB), [EPA 520-1-89-005], February 1989
This document is a draft of the original 1989 environmental impact statement for the 1989 NESHAP rulemaking.

March 7 1989 Proposed Rule (58 pp, 8.19 MB). March 1989
This is a proposed rule for the NESHAP requirements.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (1) (278 pp, 12,433 K), [EPA 520-1-89-005], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (2) (378 pp, 27 MB), [EPA 520-1-89-006-2], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

Risk Assessments Methodology, EIS, NESHAPS for Radionuclides (3) (575 pp, 1 2MB), [EPA 520-1-89-007], September 1989
This is the environmental impact statement for the 1989 NESHAP rulemaking.

December 15 1989 Final Rule (63 pp, 9.25 MB), December 1989
This is the final rule for regulating hazardous air pollutants using NESHAP.

Method 115 (3 pp, 443 K), December 1989
This is the monitoring method which must be used to determine radon emissions for Subpart W.

Subpart T Rescission (24 pp, 3.38 MB), December 1991
This document describes how EPA's uranium tailings disposal standards apply to the Department of Energy.

40 CFR Part 61 192.32 a Errata (1 pg, 131 K), November 1993
This rule replaces some language from the original operating standards for uranium recovery facilities (Subpart W).

40 CFR Part 61 General Requirements Errata (2 pp, 312 K), March 1994
This rule replaces some language from the original general operating and permitting requirements.

EPA Procedures for Determining Confidential Business Information (9 pp, 96.9 K), July 1995
This document describes the process EPA uses to determine if information is confidential business information, for purposes of the Freedom of Information Act (FOIA).

October 17 2000 Errata (1 pg, 127 K), October 2000
This document clarifies some test method and procedures language.

NRC's In-Situ Leach Facility Standard Review Plan (255 pp, 193 MB), June 2003
This NRC document provides guidance to NRC staff on reviewing applications to develop and operate uranium recovery facilities.

IAEA Uranium Mill Tailings Report (309 pp, 7.30 MB), August 2004
This document details international efforts to ensure long-term stabilization of uranium mill tailing.

EPA Contract number EP-D-05-002 (103 pp, 10.9 MB), November 2004
This document is the contract between EPA Office of Radiation and Indoor Air and S. Cohen and Associates. Note that this contract expires on March 26, 2010.

Construction of an Environmental Radon Monitoring System using CR-39 Nuclear Track Detectors (6 pp, 746. K) December 2004

Applications

Pinon Ridge Mill: Application for Approval of Construction of Tailings Facility

- Cover Letter (2 pp, 74 K), August 2010
- Application for approval of construction (8 pp, 1.77 MB), August 2010
    - Attachment 1 Operating Plan (21 pp, 13.3 MB), August 2010
    - Attachment 2 Tailings Radon Flux (34 pp, 6.37MB), August 2010
    - Attachment 3 Tailings Cell Water Balance (50 pp, 5.17 MB), August 2010
    - Attachment 4 Tailings Cell Design Report (382 pp, 38.5 MB), August 2010
- Evaporation Pond Design Report (93 pp, 13.6 MB), October 2008
- Evaporation Ponds Radon Flux Analysis (30 pp, 511 K), August 2010
- Raffinate Characterization Pinon Ridge Mill (53 pp, 1.06 MB), August 2010

Enforcement

Section 114 Letters/Responses
These documents are EPA requests (with responses as they are received) for facility information from uranium recovery facilities

- Cogema Part 1 - October 8, 2008 Response (23 pp, 7.73 MB), October 2008
- Cogema Part 2 - November 14, 2008 Response (17 pp, 5.50 MB), November 2008
- Cogema request for Radon Flux Monitoring (10 pp, 2.44 MB)
- Uranium Highland (10 pp, 2.7 MB), February 2009
- Uranium Highland Response to Section 114 Letter (10 pp, 3,01 K), March 2009
- Cameco request for Radon Flux Monitoring (10 pp, 2.46 MB)
- Uranium Energy Solutions (10 pp, 2.37 MB), February 2009
- Uranium Energy Solutions Response to Section 114 Letter (10 pp, 3,167 K), March 2009
- Uranium Denison (10 pp, 2.33 MB), February 2009
- Denison Response to Section 114 Letter (26 pp, 1.25 MB)
- Denison request for Radon Flux Monitoring (12 pp, 2.57 MB)
- Uranium Cotter (10 pp, 2,529 K), May 2009
    - 2009-05-29 Cotter's Cover Letter (1p, 22.7 K)
    - 2009-05-29 Cotter's Request for Information (29 pp, 127.8 K)
    - 2009-05-28 Cotter's Document Index (5 pp, 33.9 K)
    - Attachment 1 (5 pp, 1.5 MB)
    - Attachment 1(a) (1pg, 147.1 K)
    - Attachment 1(b) (1pg, 368.8 K)
    - Attachment 1(c) (1pg, 360.6 K)
    - 2009-05-29 Cotter's response to EPA's request to test (2 pp, 41.4 K)
- Cotter request for Radon Flux Monitoring (10 pp, 2.47 MB)
- Mestena request for Radon Flux Monitoring (10 pp, 2.45 MB)
- Mestena response to request for Radon Flux Monitoring (1p, 248.8 K)
- Crow Butte request for Radon Flux Monitoring (10 pp, 2.44 MB)

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Useful Links

- EPA's Rad-NESHAP Home page
- EPA's TENORM Home Page
- EPA's Radon Home Page
- EPA Radiation Protection Risk Assessment Home Page
- EPA's Risk Assessment for toxic air pollutants: A citizens guide
- EPA's Superfund Home Page
- EPA's Home Page for Environmental Justice Issues
- EPA's American Indian Environmental Office Home Page
- Home page of the Nuclear Regulatory Commission
- Home page of the Department of Energy
- How EPA writes regulations

Mine Location Database

EPA worked with the multi-agency Colorado Plateau Data Coordination Group Steering Committee to develop a geographic information database on uranium mines and mills. (The Agency also coordinated this effort with federal, state, and tribal agencies in other parts of the western U.S.)

The database identifies and shows the location of active and inactive uranium mines and mills, as well as mines which principally produced other minerals, but were known to have uranium in the ore. The database covers mine locations in fourteen western states. It also contains other information about the sites. Originally compiled as an important component of the uranium mining technical reports currently being developed, the database was reviewed and checked for its quality to eliminate duplicate and erroneous sites, and subjected to EPA's scientific peer review process.

The database and descriptive materials about its content are now available.

Contact Information

Reid Rosnick, Chair
202-343-9563

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www.ntaatribalair.org
928.523.0526 office
928.523.1266 fax

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004

June 13, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air
Radiation Protection Division
U.S. Environmental Protection Agency
Via email to rosnick.reid@epa.gov

Dear Mr. Rosnick,

The National Tribal Air Association (NTAA) is an autonomous organization with 80 principal member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of Indian Tribes. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions.

On behalf of the NTAA, I am writing to request that EPA extend the public comment period for the proposed rule issued in the Federal Register on May 2, 2014, which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings*". Specifically, the *NTAA is requesting the maximum comment extension period of 120 days*.

This rule addresses both conventional uranium milling operations as well as future extraction activities, namely in-situ leach/recovery (ISL) sites. Domestic uranium milling and mining operations to date have left in their wake a disturbing legacy of environmental injustice in Indian Country. As a national organization whose mission it is to advance air quality management and policies for federally recognized Tribes, it is only prudent that NTAA thoroughly evaluate the consequences of the proposed rule, including the potential impacts on Tribal communities, and subsequently provide comments to EPA. Given the serious complexity of the proposed rule, as well as the wide ranging implications for affected Tribes, we strongly request that you grant the aforementioned extension.

For our part, NTAA was only made aware of the proposed rule within the last two weeks. The public comment extension will help to promote a just and equitable public participation process by giving the NTAA, member Tribes, and those Tribes indicated on EPA's consultation list adequate time to examine the complex science and the associated human health considerations embodied in the proposed rule.

Sincerely,

Bill Thompson
Chairman, NTAA

Memo to: EPA Docket (EPA-HQ-OAR-2008-0218)

From: Anthony Nesky, EPA/OAR/ORIA/RPD

Subject: Request for a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule."

On June 10, 2014, Jennifer Thurston of INFORM Colorado called Anthony Nesky of the EPA Radiation Protection Division (RPD) in the Office of Radiation and Indoor Air (ORIA), in the Office of Air and Radiation (OAR), at the U.S. Environmental Protection Agency (EPA) to request a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule," 79 Fed. Reg. 25,388 (May 2, 2014), which proposes revisions to 40 CFR Part 61, Subpart W. Ms. Thurston explained that she was requesting the public hearing on behalf of a number of organizations who wanted public hearings in multiple locations.

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick:

REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

Uranium Watch requests a 60-day extension of the time period to submit comments on the Environmental Protection Agency's (EPA's) Proposed Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings, 49 C.F.R. Part 61 Subpart W, Docket ID No. EPA–HQ– OAR–2008–0218. 79 Fed. Reg. 25388, May 2, 2014.

The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

This incorrect factual claim regarding the Shootaring Canyon Mill and other misinformation, misleading information, incomplete information, and outdated information require a commenter to carefully review the proposed rule and supporting documents. Also, the EPA has asked for commenters' thoughts on various aspects of the proposed rule. These lengthy and detailed research and comment preparations require additional time in order to frame informed comments.

REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

Thank you for consideration of this request.

Sincerely,

Sarah Fields
sarah@uraniumwatch.org

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1 http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

Nesky, Anthony

From: sarah@uraniumwatch.org
Sent: Thursday, June 12, 2014 3:52 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Group A-AND-R-DOCKET
Subject: Amended Hearing Request and Request for Records

Dear Mr. Rosnick,

This is to amend my request for extension of time for the public to submit comments on the 40 CFR Part 16 Subpart W Rulemaking. I request a 120-day extension of time.

I have also realized that there are no Section 114 Letters/Responses for facility information for the Kennecott Sweetwater Mill. If the EPA is going to make assertions regarding the Sweetwater Mill, the documentation to support those assertions must be available to the public on the Rulemaking Docket and EPA Subpart W webpage.

Also, the EPA Background Information Document and the Risk Assessments refer to various other documents. However, there is scant information regarding public access to these records, and the EPA has not posted these documents to the EPA Subpart W Website.

A 120-day extension of time to submit comments will give the EPA time to request pertinent information from Uranium One, Energy Fuels, and Kennecott and make those responses and the documents referenced in the BID and Rick Assessments available to the public and for the public to review the documents in order to frame comments.

Thank you for your consideration of this request,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84533
435-260-8384

Memo to: EPA Docket (EPA-HQ-OAR-2008-0218)

From: Anthony Nesky, EPA/OAR/ORIA/RPD

Subject: Request for a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule."

On June 10, 2014, Jennifer Thurston of INFORM Colorado called Anthony Nesky of the EPA Radiation Protection Division (RPD) in the Office of Radiation and Indoor Air (ORIA), in the Office of Air and Radiation (OAR), at the U.S. Environmental Protection Agency (EPA) to request a public hearing on the proposed rule "Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule," 79 Fed. Reg. 25,388 (May 2, 2014), which proposes revisions to 40 CFR Part 61, Subpart W. Ms. Thurston explained that she was requesting the public hearing on behalf of a number of organizations who wanted public hearings in multiple locations.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:15 PM
To: Thornton, Marisa
Subject: FW: Missing Document for the Subpart W
Attachments: Memo to Docket requesting hearing-6-10-14.pdf

Importance: High

From: Nesky, Anthony
Sent: Monday, June 16, 2014 12:27 PM
To: Romero, Carmen
Cc: Herrenbruck, Glenna; Rosnick, Reid
Subject: Missing Document for the Subpart W
Importance: High

Dear Carmen:

Here's the one file that I still owe you for the update to Subpart W. Metadata are as follows—

- *Title: Telephone Request for Hearing on Subpart W Proposed Rulemaking*
  Author: EPA-OAR-ORIA-RPD
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, hearing request.

Do you anticipate any problems getting this update today? Thanks for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Nesky, Anthony
Sent: Monday, June 16, 2014 11:17 AM
To: Romero, Carmen
Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: We have to make some changes to the Subpart W page today
Importance: High

Cara Carmen,
We have some changes to the Subpart W page that will need to be posted today. Please post to the staging server so that all parties can review before we finalize.
On:
http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html
Please add the following two sections before the section "EPA is proposing revisions to Subpart W."

Requests for a Public Hearing
EPA has received two requests for a public hearing on the proposed rulemaking for NESHAP Subpart W. EPA plans to conduct a public hearing in response to these requests. The Agency is currently planning the public hearing and will post the information regarding the public hearing (dates, location, times, registration information, etc.) on this website as soon as it has been finalized. Interested parties should check this website for updates.
Requests for a public hearing—

- Memo to Docket on Telephone Request for Public Hearing (PDF
- Letter from Uranium Watch(PDF…)

Requests for Extension of the Public Comment Period
EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.
Requests for an extension of the public comment period—

- Request from Uranium Watch (PDF….)
- Request from NTAA (PDF..)

Note to Carment All of the PDF files for the above are attached, except for the Memo to the Docket, which I am still working on.

Metadata for the PDF files are as follows--

- *File: Uranium WatchHearingRequest-6-10-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, hearing request.

- *File: Uranium WatchExtensionRequest-6-12-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, comment period extension request.
- *File: NTAA_CommentExtReq_SubpartWRule*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: NTAA
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, comment period extension request.

After inserting the two sections above, please change the next section as follows--

EPA is proposing revisions to Subpart W. Comment period is open.

“National Emission Standards for radon emissions from Operating Uranium Mill Tailings,” Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. The docket (EPA-HQ-OAR-2008-0218) for this proposed rulemaking may be accessed at Regulations.gov. Once in the docket, you can view the proposed rule and supporting documents . The public comment period currently ends on July 31, 2014 . EPA plans to extend the public comment period

Tony Nesky
Center for Radiation Information and Outreach
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NTAA

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National Tribal Air Association
P.O. Box 15004
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June 13, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air
Radiation Protection Division
U.S. Environmental Protection Agency
Via email to rosnick.reid@epa.gov

Dear Mr. Rosnick,

The National Tribal Air Association (NTAA) is an autonomous organization with 80 principal member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of Indian Tribes. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions.

On behalf of the NTAA, I am writing to request that EPA extend the public comment period for the proposed rule issued in the Federal Register on May 2, 2014, which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings*". Specifically, the *NTAA is requesting the maximum comment extension period of 120 days*.

This rule addresses both conventional uranium milling operations as well as future extraction activities, namely in-situ leach/recovery (ISL) sites. Domestic uranium milling and mining operations to date have left in their wake a disturbing legacy of environmental injustice in Indian Country. As a national organization whose mission it is to advance air quality management and policies for federally recognized Tribes, it is only prudent that NTAA thoroughly evaluate the consequences of the proposed rule, including the potential impacts on Tribal communities, and subsequently provide comments to EPA. Given the serious complexity of the proposed rule, as well as the wide ranging implications for affected Tribes, we strongly request that you grant the aforementioned extension.

For our part, NTAA was only made aware of the proposed rule within the last two weeks. The public comment extension will help to promote a just and equitable public participation process by giving the NTAA, member Tribes, and those Tribes indicated on EPA's consultation list adequate time to examine the complex science and the associated human health considerations embodied in the proposed rule.

Sincerely,

Bill Thompson
Chairman, NTAA

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:15 PM
To:	Thornton, Marisa
Subject:	FW: We have to make some changes to the Subpart W page today
Attachments:	NTAA_CommentExtReq_SubpartWRule.pdf; UraniumWatchExtensionRequest6-12-14.pdf; UraniumWatchHearingRequest-6-10-14.pdf
Importance:	High

From: Nesky, Anthony
Sent: Monday, June 16, 2014 11:17 AM
To: Romero, Carmen
Cc: Rosnick, Reid; Herrenbruck, Glenna
Subject: We have to make some changes to the Subpart W page today
Importance: High

Cara Carmen,
We have some changes to the Subpart W page that will need to be posted today. Please post to the staging server so that all parties can review before we finalize.
On:
http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html
Please add the following two sections before the section "EPA is proposing revisions to Subpart W."

Requests for a Public Hearing
EPA has received two requests for a public hearing on the proposed rulemaking for NESHAP Subpart W. EPA plans to conduct a public hearing in response to these requests. The Agency is currently planning the public hearing and will post the information regarding the public hearing (dates, location, times, registration information, etc.) on this website as soon as it has been finalized. Interested parties should check this website for updates.
Requests for a public hearing—

- Memo to Docket on Telephone Request for Public Hearing (PDF
- Letter from Uranium Watch(PDF…)

Requests for Extension of the Public Comment Period
EPA has received two requests for EPA to extend the public comment period for the proposed rulemaking for NESHAP Subpart W. The public comment period currently ends on July 31, 2014. The requestors have asked EPA to extend the public comment period by 120 days. EPA plans to extend the public comment period in response to these requests but has not yet determined the length of that extension. EPA will publish a Federal Register notice when it finalizes its decision regarding the extension of the public comment period. EPA will also post information regarding the extension of the public comment period on this website as soon as it has been finalized. Interested parties should check this website for updates.
Requests for an extension of the public comment period—

- Request from Uranium Watch (PDF….)
- Request from NTAA (PDF..)

Note to Carment All of the PDF files for the above are attached, except for the Memo to the Docket, which I am still working on.

Metadata for the PDF files are as follows--

- *File: Uranium WatchHearingRequest-6-10-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, hearing request.

- *File: Uranium WatchExtensionRequest-6-12-14*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: Uranium Watch
  Subject: National Emission Standards, NESHAP, Proposed Rulemaking
  Keywords: Subpart W, proposed rulemaking, comment period extension request.
- *File: NTAA_CommentExtReq_SubpartWRule*
  Title: Public Hearing Request for Subpart W Proposed Rulemaking
  Author: NTAA
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EPA is proposing revisions to Subpart W. Comment period is open.

"National Emission Standards for radon emissions from Operating Uranium Mill Tailings," Subpart W of 40 CFR Part 61. The proposed rule would require the use of generally available control technology (GACT) to limit radon emissions from tailings at all uranium recovery facilities. Specific control technologies would be required at conventional tailings impoundments, evaporation ponds and heap leach piles. The public is invited to submit comments on the proposed rulemaking. The docket (EPA-HQ-OAR-2008-0218) for this proposed rulemaking may be accessed at Regulations.gov. Once in the docket, you can view the proposed rule and supporting documents . The public comment period currently ends on July 31, 2014 . EPA plans to extend the public comment period

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Uranium Watch

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Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick:

REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

Uranium Watch requests a 60-day extension of the time period to submit comments on the Environmental Protection Agency's (EPA's) Proposed Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings, 49 C.F.R. Part 61 Subpart W, Docket ID No. EPA–HQ– OAR–2008–0218. 79 Fed. Reg. 25388, May 2, 2014.

The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

This incorrect factual claim regarding the Shootaring Canyon Mill and other misinformation, misleading information, incomplete information, and outdated information require a commenter to carefully review the proposed rule and supporting documents. Also, the EPA has asked for commenters' thoughts on various aspects of the proposed rule. These lengthy and detailed research and comment preparations require additional time in order to frame informed comments.

REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

Thank you for consideration of this request.

Sincerely,

Sarah Fields
sarah@uraniumwatch.org

[1] http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

Nesky, Anthony

From: sarah@uraniumwatch.org
Sent: Thursday, June 12, 2014 3:52 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Group A-AND-R-DOCKET
Subject: Amended Hearing Request and Request for Records

Dear Mr. Rosnick,

This is to amend my request for extension of time for the public to submit comments on the 40 CFR Part 16 Subpart W Rulemaking. I request a 120-day extension of time.

I have also realized that there are no Section 114 Letters/Responses for facility information for the Kennecott Sweetwater Mill. If the EPA is going to make assertions regarding the Sweetwater Mill, the documentation to support those assertions must be available to the public on the Rulemaking Docket and EPA Subpart W webpage.

Also, the EPA Background Information Document and the Risk Assessments refer to various other documents. However, there is scant information regarding public access to these records, and the EPA has not posted these documents to the EPA Subpart W Website.

A 120-day extension of time to submit comments will give the EPA time to request pertinent information from Uranium One, Energy Fuels, and Kennecott and make those responses and the documents referenced in the BID and Rick Assessments available to the public and for the public to review the documents in order to frame comments.

Thank you for your consideration of this request,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84533
435-260-8384

UTE MOUNTAIN UTE TRIBE'S INITIAL QUESTIONS
Environmental Protection Agency, Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings, Proposed Rule
40 C.F.R. Part 61
Submitted on June 13, 2014 in preparation for government-to-government consultation, July 10, 2014

I. EPA, INDIAN TRIBES, AND EXECUTIVE ORDER 13175

1. The Environmental Protection Agency's (EPA) statement regarding compliance with Executive Order 13175 states that the Subpart W rulemaking action does not have "tribal implications" because the rulemaking does not impose regulatory requirements on tribal governments. Please be prepared to discuss how the following issues impact the EPA's Executive Order 13175 analysis:

   - Although Native Americans make up only 1.4 percent of Utah's racial profile (and 0.9 percent of the United States' racial profile), they make up 55.8 percent of the racial profile for San Juan County, Utah (the county where the White Mesa Mill (WMM) is located).
   - The WMM facility is located on aboriginal lands of the Ute Mountain Ute Tribe.
   - The WMM facility is located adjacent to land and other Indian Trust Assets held in trust by the United States on behalf of the Ute Mountain Ute Tribe (and less than 3 miles from the nearest Tribal resident).
   - The Tribal community located in White Mesa is downgradient of the WMM facility.
   - The Tribal community located in White Mesa is completely dependent on groundwater supplies located underneath the WMM facility and tailings cells.
   - Activities and operations at the WMM have already impacted Tribal members' abilities to use surface, plant, wildlife, and surface water resources on public and Tribal lands.

2. Please be prepared to discuss how the EPA will address Tribal concerns during this Subpart W rulemaking and related rulemaking processes (including, but not limited to, the anticipated revision to 40 C.F.R. Part 192).

3. Please be prepared to discuss how or whether the EPA undertook analysis of how this rulemaking will impact UMU Tribal members, UMU Tribal lands, and Indian Trust Assets.

II. NESHAPS/CLEAN AIR ACT QUESTIONS

4. Has the EPA evaluated establishing a lesser quantity or different criteria for major sources of radionuclides under Section 112(a)(1) of the CAA? *See* footnote 2, page 25390 of the proposed rulemaking (noting that *none* of the uranium recovery facilities are major sources under NESHAPS).

5. On page 25390 of the proposed rulemaking, the EPA identifies the "source category" for Subpart W using 40 C.F.R. § 61.250 and the proposed definition of "uranium recovery facility." Has the EPA listed uranium recovery facilities as a category or subcategory of sources under Section 112(c) of the Clean Air Act? If so, please provide an explanation and documentation in advance of the consultation meeting.

6. On page 25390 of the proposed rulemaking, the EPA states, "Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings." However, the proposed Subpart W rulemaking only covers some HAP sources at uranium recovery facilities, and not others (such as stackhouses, ore pad, ore grinder, and the Mill yard, see Question 7, *infra*). Please explain the EPA's rationale for excluding such HAP sources at conventional uranium mills.

7. On page 25390 of the proposed rulemaking, the EPA states: "We presently have no data or information that shows any other HAPs being emitted from these impoundments." Please provide a response to the following initial questions, data, and information regarding other HAPs that may be emitted from the WMM.

    - The WMM's 10 C.F.R. § 40.65 environmental airborne particulate monitoring program monitors for natural uranium (Uranium-238, Uranium-234, Uranium-235), Thorium-230, Radium-226, and Lead-210. This air monitoring program has detected all four isotopes at all of the air monitoring stations. Additionally, the WMM has identified Lead-210, Thorium-230, Thorium-232, Polonium-210, Radium-226, and Radium-228 in wastewater samples from the tailings impoundments. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
    - The WMM processes uranium ore. During the uranium storage and milling processes, there may be more than three dozen radioactive isotopes present at the WMM facility (including actinium, astatine, bismuth, francium, lead, polonium, protactinium, radium, radon, thallium, thorium, and uranium). *See* Uranium Decay Series diagram on page 44 of the Technical and Regulatory Support document. This indicates that sources at the WMM (including the tailings impoundments, stackhouses, ore pad, ore grinder, and the Mill yard) are emitting radionuclides other than Radon-222.
    - The WMM's uranium milling process uses significant quantities of chemicals (sodium chlorate is used during ore oxidation; sulfuric acid and flocculants are used during the leaching and clarification; secondary amines/kerosene, tri-alkyl amines/tributyl phosphate modifier, and quaternary ammonium compounds/alcohol are used during the solvent extraction; chlorides and sulfates are used during pregnant liquor stripping; and ammonia hydroxide and sodium hydroxide during yellowcake precipitation). During the storage and use of these chemicals, and after these chemicals are disposed in the tailings impoundments, there may be significant emissions of HAPs at the WMM.

- The WMM processes alternate feed materials. During the alternate feed storage and milling processes, other radioactive isotopes, non-metal compounds, and other regulated HAPs may be emitted from the WMM.
- The WMM processes vanadium ore. Vanadium is considered to be dangerous to life and health by both the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health, and may be listed as a HAP in the future. The WMM's vanadium recovery process uses a significant quantity of chemicals (sodium chlorate is used during the redox/pH adjustment; kerosene and secondary amines are used during the solvent extraction; soda ash is used during the vanadium pregnant liquor stripping process; and ammonia hydroxide is used during the vanadium precipitation). This indicates that the vanadium recovery process results in the emission of HAPs other than Radon-222 from the WMM facility.

8. On page 25390 of the proposed rulemaking, the EPA states that it evaluated the MACT standards applicable to major sources in the same industrial sector. Please provide the Tribe with this analysis prior to the consultation, and be prepared to explain the MACT analysis that the EPA performed during this rulemaking process.

9. Please explain how the EPA evaluated the use of a work practice standard, rather than an emissions standard, for the control of a HAP under the proposed rulemaking. *See* Section 112(h), Clean Air Act. Please specifically address the EPA's determination to remove the current emissions standard for existing impoundments. Please also explain how removing the emissions standard from Subpart W will affect: (a) how the WMM facility sets and meets the ALARA goal to protect worker and adjacent communities from radionuclides; and (b) monitoring of radon emissions under 10 C.F.R. Part 40, Appendix A.

III. SUBPART W AND CLOSURE OF LEGACY IMPOUNDMENTS

10. In 1989, when the EPA proposed the current Subpart W NESHAP, the EPA concluded that, "Existing mill tailing piles are large piles of waste that emit radon. There is nothing that can be done to reduce the amount of radon they emit except cover them." 54 FR 9644 (March 7, 1989). EPA crafted Subpart W to prohibit uranium mills from having more than two tailings impoundments in operation. Explain why the EPA has not required closure of the legacy Tailings Cells 1, 2, and 3 at the WMM, as contemplated and required by the current NESHAP.

11. In this proposed rulemaking, the EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Explain how the EPA can justify the long-term risk of having almost 300 acres of tailings impoundments that are either in operation or in closure but without a permanent radon barrier at the WMM. *See also* questions on conventional and non-conventional impoundments.

IV. DEFICIENT OR INCORRECT ANALYSIS OF OPERATIONS AND FACILITIES AT THE WMM

12. The owners of the WMM state in the June 1, 2009 letter response to EPA's CAA Section 114 Information Request that Tailings Cells 1, 2, and 3 meet the requirements of 40 C.F.R. 192.32(a). The WMM owners specify that these specific Tailings Cells meet the design and operating requirements under 40 C.F.R. 264.221(a). Please explain how the EPA evaluated the WMM owners' assertions regarding compliance with 40 C.F.R. 192.32(a) and 40 C.F.R. 264.221(a), given the following:
    - The liners in Tailings Cells 1, 2, and 3 were designed for a 15-year life and were installed between May 1980 and September 1982. These impoundments have already been in operation for over 30 years.
    - Contamination of the shallow groundwater underlying Tailings Cells 1, 2, and 3 has been documented and is the subject of investigation and corrective action to address elevated chloroform, nitrate and chlorides. There is significant evidence that the liners on Tailings Cells 1, 2, and 3 have already allowed migration of waste out of the impoundments into the adjacent groundwater.
    - The Agreement State and the WMM owners treat the shallow groundwater aquifer under the WMM facility as the leak detection system for Tailings Cells 1, 2, and 3 (and developed a groundwater monitoring program that can detect tailings cell leakage only after waste has migrated out of these legacy impoundments).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 do not have appropriate chemical properties and sufficient strength and thickness to prevent failure due to conditions outlined in 40 C.F.R. § 264.221(a)(1).
    - The single, 30-mil PVC liners in Tailings Cells 1, 2, and 3 are not compatible with alternate feed materials contained in the impoundments.

13. Several important sections of the proposed rulemaking rely on the provisions of 40 C.F.R. § 264.221(c) (and not 40 C.F.R. § 264.221(a)) to explain protection of groundwater or other environmental analysis. *See, e.g.*, page 25393 (setting forth specific liner requirements from 40 C.F.R. § 264.221(c)); page 25397 (specifically relying on safeguards from a leak detection system); page 25401 (specifying that the proposed GACT is for double liners on non-conventional impoundments). The provisions of 40 C.F.R. § 264.221(c) are significantly more protective of groundwater, human health, and the environment.

    - Is the EPA taking the position that all conventional impoundments and non-conventional impoundments must meet the requirements of 40 C.F.R. § 264.221(c)? If so, please clarify the EPA's position on whether Tailings Cells 1, 2, and 3 at the WMM meet the requirements of 40 C.F.R. § 264.221(c).

    - If the EPA is <u>not</u> taking the position that 40 C.F.R § 264.221(c) applies to all conventional and non-conventional impoundments, please explain how the EPA addressed risks to groundwater from legacy impoundments like Tailings Cells 1,

2, and 3. Please specifically address how the EPA assessed the risk of groundwater contamination from Tailings Cell 1. *See* question 12, *supra*.

14. Please explain how (or if) the EPA's specific analysis of the WMM facility addressed the following:

- Cell 2 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
- Method 115 monitoring on Cell 2 detected a Subpart W NESHAPS violation in 2012/2013 over the 20 pCi/m2-s limit.
- Cell 3 is currently licensed to receive 11(e)(2) byproduct material (liquids and solids).
- Cell 3 is currently the only tailings cell at the WMM that receives certain forms of 11(e)(2) byproduct material (materials trucked in, including ISL waste).
- The WMM facility has not historically operated its "conventional" and "non-conventional" tailings impoundments separately. Tailings Cell 4A was operated as a "non-conventional" impoundment, which resulted in surface and groundwater contamination until the cell was retrofitted starting in 2008. Tailings Cell 4B is currently operated as a "non-conventional" impoundment, but the WMM owners indicate that it will be used as a "conventional" impoundment in the future.
- Under currently approved and proposed reclamation plans for the WMM, the permanent radon barriers will not be placed on *any* tailings impoundments until final reclamation at the facility.

V. NON-CONVENTIONAL IMPOUNDMENTS

15. How did the EPA develop the proposed definition of "non-conventional impoundments"?

16. Please explain how the EPA will distinguish between conventional and non-conventional impoundments.

    a. Is there a minimum amount of liquid that must be present in the pond for the EPA to classify a tailings impoundment as a non-conventional impoundment, or can a facility owner convert a conventional impoundment into a non-conventional impoundment by adding the minimum 1m of liquid on the top of the impoundment?

    b. Will the final reclamation or removal plan for a tailings impoundment determine whether it qualifies as a "non-conventional impoundment"?

        - Please explain how the EPA will treat Tailings Cell 1 at the WMM (noting that the WMM owners plan to remove solids from the cell upon final reclamation, but then permanently dispose of debris from the Mill facilities and contaminated soil in the cell). *See* June 1, 2009 Response Letter at 6; page 25405 of the proposed rulemaking (addressing the disposal of byproduct material like deconstruction material during facility reclamation).

- Please explain how the EPA will treat Tailings Cell 4B at the WMM (which the WMM owner is currently operating as a non-conventional impoundment, but which will become a conventional impoundment before final reclamation).

17. The WMM is currently authorized to temporarily place liquid 11(e)(2) byproduct material in "Roberts Pond" (before pumping the liquid into Tailings Cells 1 and 4B). Does Roberts Pond meet the proposed definition of a "non-conventional impoundment"? *See* pages 25390, 25393 of the proposed rulemaking (addressing "holding" and "collection" ponds). Please explain how EPA has assessed the Radon-222 emissions from Roberts Pond and from the regular transfer of process water from Roberts Pond to Tailings Cells 1 and 4B.

18. Please explain the EPA's rationale for allowing non-conventional impoundments to exist until removal at facility closure.

    - Did the EPA analyze whether allowing water-covered impoundments to exist for the life of a facility increases risks of groundwater and surface water contamination? Please see question 12 (and explain EPA's position on the 15-year design life for Tailings Cell 1 at the WMM).
    - How will the EPA ensure that non-conventional impoundments are periodically retrofitted to ensure that the impoundments do not contaminate groundwater and surface water?

19. EPA acknowledges that there is a linear relationship between the area of a tailings impoundment and Radon-222 emissions (which justifies the size restrictions on conventional impoundments). *See* page 25393 of the proposed rulemaking. Please explain why this linear relationship does not also justify size restrictions on non-conventional impoundments (and please specifically address how this linear relationship will impact Radon-222 emissions when large non-conventional impoundments are dewatered and closed).

20. How has the EPA analyzed what risks non-conventional impoundments (including large non-conventional impoundments like Tailings Cell 1 at the WMM) will pose to human health and the environment when they are de-watered and decommissioned?

21. How will the proposed rule address tailings impoundments that are used as conventional and non-conventional impoundments (such as Tailings Cells 4A and 4B at the WMM)? How will the EPA "count" these cells using the 2-cell limit in the conventional impoundment work practice standard?

22. The EPA's analysis that using liquids to cover tailings cells "has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero" is insufficient to demonstrate that Tailings Cell 1 at the WMM has a radon flux of "almost zero" (or even under 20 pCi/m2-s).

Based on the information and questions below, please provide the EPA's specific analysis of the calculated radon emissions from Tailings Cell 1, Tailings Cell 4B, and Roberts Pond at the WMM. Please then explain how EPA calculates the dose to the White Mesa Tribal community (considering radon emissions from Tailings Cell 1 and 4B and Roberts Pond, along with radon emissions from "conventional" impoundments 2, 3, and 4A).

a. The proposed rulemaking recognizes that covering tailings impoundments with water does not reduce radon emissions to zero. *See, e.g.*, Radon Emission from Evaporation Ponds (noting that the radon flux above some evaporation ponds can be significant/exceed 20 pCi/m2-s).
b. The proposed rulemaking contemplates the use of radium-laden "process water" to provide liquid covers on non-conventional impoundments, but does not address whether the use of radium-laden process water increases the radon emissions from a non-conventional impoundment. The EPA analysis justifying the use of the 1 meter water cover relies on the assumption that the water cover is not laden with radium. The EPA analysis also calculates significant radon flux from non-conventional impoundments containing radium-laden water. Please justify the EPA's position that 1 m of radium-laden process water can decrease radon flux from tailings impoundments like Tailings Cell 1 at WMM to zero.
c. The EPA's analysis of radon emissions from liquid-covered impoundments recognizes that there are significant radon emissions during the transfer of radium-laden waters to and between tailings impoundments and during enhanced evaporation sprays, but it does not calculate or address these emissions for conventional mills like the WMM.
d. Using the radon flux equation contained in Section 4.0 of the Radon Emissions from Evaporation Ponds report along with the actual radium content[1] in Tailings Cell 1, the Tribe's initial calculation on the radon flux from Tailings Cell 1 is 327 pCi/m2-s (not including emissions during transfer into Cell 1 or during enhanced evaporation sprays).

VI. CONVENTIONAL IMPOUNDMENTS

23. The Tribe is generally confused about the EPA's approach to Tailings Cells 2 and 3 at the WMM. The EPA seems to recognize that neither of these tailings cells meets the work practice standards proposed in this rulemaking. *See* page 25395 of the proposed rulemaking (noting that Cell 3 could not meet the work practice standards). Given that both tailings impoundments are still licensed by the Agreement State to receive liquid and solid 11(e)(2) byproduct material and that neither tailings impoundment has a tailings closure plan with milestones for placement of a permanent radon barrier, please explain how the EPA can continue to justify removing the monitoring requirements and emissions limits that currently apply to these impoundments.

[1] To determine the actual radium content, the Tribe used the 32,700 pCi/L Gross Radium Alpha concentration provided in the in the 2013 Annual Tailings Report.

24. The Tribe is concerned that, although Tailings Cell 2 had a recent violation of the 20 pCi/m2-s emissions limit that applies to existing impoundments (and although that violation was detected during monitoring conducted under Method 115), the EPA did not consider Cell 2 when considering how the proposed rulemaking would impact the WMM. Please explain why the EPA omitted any analysis of Cell 2 and the recent Subpart W violation at Cell 2. Please also explain how the EPA will ensure that emissions from Tailings Cell 2 do not exceed 20 pCi/m2-s between now and when the final radon barrier is placed during final reclamation of the entire facility (given that the EPA is proposing to eliminate both the emissions limit and the monitoring to detect Radon-222 emissions over 20 pCi/m2-s).

25. The proposed rulemaking references the use of an "interim cover" on Tailings Cells 2 and 3 at the WMM. The Tribe is concerned that the WMM owners have used this "interim cover" on Tailings Cell 2 for more than a decade (and that the use of this cover has already resulted in Radon-222 emissions of over the 20 pCi/m2-s limit) and that the Reclamation Plan for the WMM contemplates the use of such "interim covers" until final reclamation at the facility. Please explain whether and how the EPA justifies the use of interim covers (and not the immediate placement of permanent radon barriers).

VII. APPLICABILITY OF 40 C.F.R. PART 192

26. A significant portion of the EPA's analysis in the proposed rulemaking (including analysis on impacts to the environment and human health, analysis on weather and other hazards, and economic analysis) rests on the assumption that all tailings impoundments (conventional and non-conventional) meet the standards set forth in 40 C.F.R. § 192.32(a)(1) and 40 C.F.R. § 264.221. How will the EPA ensure that all the tailings impoundments at the WMM facility meet the applicable federal standards?

27. The EPA is proposing to eliminate internal cross references to the sections of 40 C.F.R. Part 192 that cover placement of permanent radon barriers on tailings impoundments. Additionally, although the EPA identified the need to better define "closure" under Subpart W, the revisions to the terms "standby" and "operation" in the proposed rulemaking do not define or address "closure" under the revised Subpart W NESHAP regulations.
    - How will the EPA determine whether a tailings impoundment has entered "final closure" for Subpart W NESHAP purposes?
    - If the EPA no longer intends to utilize other portions of 40 C.F.R. Part 192 (including, but not limited to, the definitions of "Tailings Closure Plan," "Permanent Radon Barrier," and requirements that the permanent radon barrier be constructed as expeditiously as possible and in accordance with a tailings closure plan), how will the EPA ensure that permanent radon barriers are properly placed on tailings cells? Here, please address the Tribe's concern that, under current reclamation plans for the WMM, the permanent radon barriers for Cells 2 and 3 will not be placed under final reclamation of the facility (and that there are no Tailings Closure Plans, as defined in 40 C.F.R. Part 192, with milestones for the expeditious placement of the permanent radon barriers).

28. The Tribe is concerned that the Tribal community in White Mesa will be exposed to elevated levels of Radon-222 when the WMM facility undertakes de-watering or other closure activities or allows Tailings Cells 2 and 3 to remain open under an "interim cover." Please explain how the EPA has specifically assessed the anticipated dose to the White Mesa Community *during* the closure period. Please also explain how the EPA will ensure that Tribal members, Tribal lands and other Indian Trust Assets are not exposed to Radon-222 emissions in excess of 20 pCi/m2-s during the closure period.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:15 PM
To: Thornton, Marisa
Subject: FW: Initial Questions from the UMUT
Attachments: NESHAPS Questions for EPA FINAL.pdf

From: Celene Hawkins [mailto:chawkins@utemountain.org]
Sent: Friday, June 13, 2014 8:11 PM
To: Rosnick, Reid; sclow@utemountain.org
Cc: clarrick@utemountain.org; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: Initial Questions from the UMUT

Dear Reid,

Attached are the initial questions from the UMUT to help the EPA and UMUT prepare for the July 10th consultation meeting. We hope that having a full discussion of these questions in the June 24-26 time period helps to make sure that we can have meaningful dialogue at the July 10th consultation meeting. Please plan accordingly when you put together your team and a time frame for the conference call (we anticipate here that it will take a few hours to get through the 28 questions).

I wanted to reiterate my offer to have a call between now and our June conference call with your EPA attorneys if there are concerns about the exchange of written materials or substantive discussion on any of the points contained in the initial questions list.

Best,

Celene Hawkins
Associate General Counsel
Ute Mountain Ute Tribe

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, June 13, 2014 8:28 AM
To: Scott Clow
Cc: Colin Larrick; Celene Hawkins; Tomoe Natori; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: RE: call next week Tuesday or Wednesday?

Scott,

OK. I'll start checking for times in the 24th-26th time period.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Thursday, June 12, 2014 10:34 AM
To: Rosnick, Reid
Cc: clarrick@utemountain.org; Celene Hawkins; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Mark

Smith
Subject: RE: call next week Tuesday or Wednesday?

Reid,
We are trying to get them finalized tomorrow (Friday) to send, but it may roll into Monday. Perhaps with that in mind we should scratch next Tuesday-Wednesday and aim for the 24-26th time frame. That will still give you a couple weeks before the consultation date to prepare.
SCott

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Thursday, June 12, 2014 4:20 AM
To: Scott Clow
Cc: Colin Larrick; Tomoe Natori; Michael King; 'mKeller@vancott.com'; Celene Hawkins; Mitre, Alfreda; Stahle, Susan; Peake, Tom; Childers, Pat; Harrison, Jed
Subject: RE: call next week Tuesday or Wednesday?

Hi Scott,

We would like to have the conference call with you as soon as practicable. However, we would like to have your questions in hand so we can discuss them with you during the call. Can you give me a better idea of when you will be able to transmit your questions? I would like at least a day or two to get them to EPA participants so we can discuss your concerns more effectively. Thanks.

I'll be away from my desk all day, in training, but I will check my email and voice mail at the end of the day. Thanks again.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Wednesday, June 11, 2014 6:31 PM
To: Rosnick, Reid
Cc: clarrick@utemountain.org; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Celene Hawkins; Mitre, Alfreda
Subject: call next week Tuesday or Wednesday?

HI Reid,
We are working on preparing the questions that we will want answers for at the upcoming consultation meeting. We are planning to have those to your team at EPA in the next few days.
We would like to schedule our second pre-consultation call to clarify the questions. We have availability next Tuesday (I can skip out of a little of my ROC meeting if necessary) or Wednesday afternoon. I think we could bump it into the following week, 24-26th but I will need to confirm that with our team. Please consider some dates.
Thanks,
Scott

************************* ATTACHMENT REMOVED *************************

This message contained an attachment which the administrator has caused
to be removed.

************************* ATTACHMENT REMOVED *************************

Attachment name: [image001.jpg]
Attachment type: [image/jpeg]

NTAA

www.ntaatribalair.org
928.523.0526 office
928.523.1266 fax

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004

June 13, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air
Radiation Protection Division
U.S. Environmental Protection Agency
Via email to rosnick.reid@epa.gov

Dear Mr. Rosnick,

The National Tribal Air Association (NTAA) is an autonomous organization with 80 principal member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of Indian Tribes. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions.

On behalf of the NTAA, I am writing to request that EPA extend the public comment period for the proposed rule issued in the Federal Register on May 2, 2014, which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings*". Specifically, the *NTAA is requesting the maximum comment extension period of 120 days*.

This rule addresses both conventional uranium milling operations as well as future extraction activities, namely in-situ leach/recovery (ISL) sites. Domestic uranium milling and mining operations to date have left in their wake a disturbing legacy of environmental injustice in Indian Country. As a national organization whose mission it is to advance air quality management and policies for federally recognized Tribes, it is only prudent that NTAA thoroughly evaluate the consequences of the proposed rule, including the potential impacts on Tribal communities, and subsequently provide comments to EPA. Given the serious complexity of the proposed rule, as well as the wide ranging implications for affected Tribes, we strongly request that you grant the aforementioned extension.

For our part, NTAA was only made aware of the proposed rule within the last two weeks. The public comment extension will help to promote a just and equitable public participation process by giving the NTAA, member Tribes, and those Tribes indicated on EPA's consultation list adequate time to examine the complex science and the associated human health considerations embodied in the proposed rule.

Sincerely,

Bill Thompson
Chairman, NTAA

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218
Attachments: removed.txt; NTAA_CommentExtReq_SubpartWRule.pdf

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From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 13, 2014 4:46 PM
To: Rosnick, Reid; Group A-AND-R-DOCKET
Cc: Childers, Pat; Harrison, Jed; Mehrdad.Khatibi@NAU.EDU; ann-marie.chischilly@nau.edu; Cristina Gonzalez-Maddux; Flynn, Mike; Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Bill.Thompson@Penobscotnation.org; air@lldrm.org; Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com; Kellie Poolaw (kelliej@pawneenation.org); greenleaf@kootenai.org; lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com
Subject: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

Hell Mr. Rosnick:

I am pleased to forward on a letter from the NTAA Chairman, Bill Thompson regarding EPA Docket # EPA-HQ-OAR-2008-0218. This letter requesting a comment period extension is in advance of NTAA's forthcoming comments on this proposed rule.

Please confirm receipt of this letter and feel free to contact me with any clarification and/or questions regarding this request.

We look forward to response to this request.

Thank you,

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266

www.ntaatribalair.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:18 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

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Sent: Thursday, June 12, 2014 12:40 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

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-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 9:02 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Thank you for your help—and patience. I'm sorry that this process has become so drawn out.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 11:00 AM
To: Nesky, Anthony
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, I will reserve the rooms for 8/4 and 8/5. The max capacity is 60 people each day.

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From: Nesky, Anthony
Sent: Thursday, June 12, 2014 8:45 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Reid is out until tomorrow. Could we go ahead and reserve the rooms, and cancel tomorrow if Reid isn't available those days. If that approach doesn't cause any problems for Region 8, please reserve the rooms. If it is a problem, we'll just have to wait until Reid is back.

Thanks again for all your support on these hearings!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 10:38 AM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

The only two consecutive days in a row in August available are 8/4 and 8/5. Let me know if these work because I'll have to reserve them ASAP before someone else gets them.

Thank you,
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From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 11:52 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Angelique:

Thanks for all your help—I'm sorry this is proving to be such a hassle. We basically need to hold the meetings in August. Would it be possible to book any two consecutive days during the week of August 18? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
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Sent: Wednesday, June 11, 2014 12:55 PM
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Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

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Dear Whitney and Angelique:

We want to reschedule the hearings. Might you have rooms available on August 26-27?

Thanks, as always for your help!

Tony Nesky
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From: Diaz, Angelique
Sent: Monday, May 19, 2014 4:13 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Voice Mail message

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:18 PM
To:	Thornton, Marisa
Subject:	FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 12:44 PM
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Sent: Tuesday, September 02, 2014 4:18 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 2:22 PM
To: Nesky, Anthony
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Just checked. July 21 and 22 are available. Let me know tomorrow so we can finalize the reservation. Am I missing something? I'm not sure what Reid's vacation the week of July 28th has to do with any of the dates.

So again here are the options:

7/21 and 7/22
8/4 and 9/5
9/2 and 9/3
9/3 and 9/4

-Angelique

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Tony, sorry for the additional e-mail, but the rooms we have on Monday, 6/16 hold 100 and on Tuesday, 6/17, the max is 60 people.

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Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:18 PM
To: Thornton, Marisa
Subject: FW: Amended Hearing Request and Request for Records

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Thursday, June 12, 2014 3:52 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Group A-AND-R-DOCKET
Subject: Amended Hearing Request and Request for Records

Dear Mr. Rosnick,

This is to amend my request for extension of time for the public to submit comments on the 40 CFR Part 16 Subpart W Rulemaking. I request a 120-day extension of time.

I have also realized that there are no Section 114 Letters/Responses for facility information for the Kennecott Sweetwater Mill. If the EPA is going to make assertions regarding the Sweetwater Mill, the documentation to support those assertions must be available to the public on the Rulemaking Docket and EPA Subpart W webpage.

Also, the EPA Background Information Document and the Risk Assessments refer to various other documents. However, there is scant information regarding public access to these records, and the EPA has not posted these documents to the EPA Subpart W Website.

A 120-day extension of time to submit comments will give the EPA time to request pertinent information from Uranium One, Energy Fuels, and Kennecott and make those responses and the documents referenced in the BID and Rick Assessments available to the public and for the public to review the documents in order to frame comments.

Thank you for your consideration of this request,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84533
435-260-8384

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Sent: Tuesday, September 02, 2014 4:17 PM
To: Thornton, Marisa
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From: Nesky, Anthony
Sent: Thursday, June 12, 2014 4:55 PM
To: Stahle, Susan
Cc: Rosnick, Reid
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See the below email from Uranium Watch.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

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To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Rosnick, Reid
Sent: Friday, June 13, 2014 6:17 AM
To: Nesky, Anthony
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

I'm on vacation until August 5. Sorry

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 10:41 AM
To: Rosnick, Reid
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27
Importance: High

Reid, what do you think of August 4-5?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 10:38 AM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

The only two consecutive days in a row in August available are 8/4 and 8/5. Let me know if these work because I'll have to reserve them ASAP before someone else gets them.

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Denver, CO 80202-1129
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Fax: 303.312.6064
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We want to reschedule the hearings. Might you have rooms available on August 26-27?

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From: Diaz, Angelique
Sent: Monday, May 19, 2014 4:13 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Voice Mail message

Tony, sorry for the additional e-mail, but the rooms we have on Monday, 6/16 hold 100 and on Tuesday, 6/17, the max is 60 people.

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Environmental Engineer
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Office: 303.312.6344

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:17 PM
To: Thornton, Marisa
Subject: FW: Subpart W Rulemaking Documents

From: Rosnick, Reid
Sent: Friday, June 13, 2014 8:05 AM
To: Diaz, Angelique
Subject: FW: Subpart W Rulemaking Documents

From: Rosnick, Reid
Sent: Friday, June 13, 2014 6:12 AM
To: Stahle, Susan
Subject: FW: Subpart W Rulemaking Documents

FYI

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Thursday, June 12, 2014 1:25 PM
To: Rosnick, Reid
Cc: Group A-AND-R-DOCKET
Subject: Subpart W Rulemaking Documents

Dear Mr. Rosnick,

The following have become apparent:

1. The EPA did not receive a Clean Air Act (CAA) Section 114 response from Uranium One about the Shootaring Canyon Mill, and maybe did not even request such information. If the EPA had received such information, the EPA would not have made a false and misleading statement about the nature of the Shootaring Canyon tailings impoundment liner in the Subpart W Rulemaking May 2, 2014, *Federal Register* Notice (79 Fed. Reg. 25388).

2. The EPA never received a response from Denison Mines (USA) Corp. to the May 2009 CAA Section 114 letter requesting information about the evaporation ponds at the White Mesa Mill. This is apparent by the lack of information about the evaporation ponds at the White Mesa Mill in the "Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings; Task 5 – Radon Emission from Evaporation Ponds," by S. Cohen & Associates, November 9, 2010. The evaluation of Radon Emissions from Evaporation Ponds does not reference any Denison Mines communication and does not discuss the White Mesa Mill evaporation ponds. Clearly the EPA contractor did not have the pertinent information before them regarding the White Mesa Mill evaporation ponds.

3. The EPA must request, receive, and post the same information about the Shootaring Canyon Mill that was received for other uranium mills. The EPA must again request that the licensee, now Energy Fuels Resources Inc., provide information about the impoundments at the White Mesa Mill that store processing

liquids. This would include Cells 1 and 4B, Robert's Pond, and the fluids on top of Cells 3 and 4A. This would include data on the radium and other radiological contents of the fluids in these impoundments over time.

4. The EPA must extend the comment period to provide an opportunity for the EPA to obtain this relevant information, make it publicly available, and allow for public review.

5. The EPA should seriously consider withdrawing the May 2, 2014, *Federal Register* Notice, because the the proposed rule, as it applies to conventional uranium mill tailings impoundments, is based, in a significant part, on the incorrect and unsubstantiated claim that the Shootaring Canyon tailings impoundment has a synthetic liner. Therefore, the proposed rule lacks a significant factual basis.

Sincerely,

Sarah Fields
Program Director
Uranium Watch
PO Box 34
Moab, Utah 84532
435-260-8384

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:17 PM
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Subject:	FW: Dates when the Region 8 Hearing Room is available so far.

From: Rosnick, Reid
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To: Nesky, Anthony
Cc: Diaz, Angelique; Herrenbruck, Glenna; Miller, Beth; Schultheisz, Daniel
Subject: RE: Dates when the Region 8 Hearing Room is available so far.

Tony,

I am leaning toward the 9/3-9/4 dates, but I have a few questions. Could you please explain what the contractor would be doing for us at the public hearing? Do we think these activities could be covered by us or Regional people? Is it possible we could request a 2 month no-cost extension of the work assignment? Thanks

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Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 11:52 AM

To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Angelique:

Thanks for all your help—I'm sorry this is proving to be such a hassle. We basically need to hold the meetings in August. Would it be possible to book any two consecutive days during the week of August 18? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Wednesday, June 11, 2014 12:55 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, there are no rooms available on those dates. I am having our scheduler check in August and September for rooms that are available for 2 days in a row. I'll let you know when I hear back from her.

-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
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Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Whitney and Angelique:

We want to reschedule the hearings. Might you have rooms available on August 26-27?

Thanks, as always for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:17 PM
To: Thornton, Marisa
Subject: FW: Dates when the Region 8 Hearing Room is available so far.

From: Miller, Beth
Sent: Friday, June 13, 2014 10:30 AM
To: Daigler, Valerie; valerie13
Subject: FW: Dates when the Region 8 Hearing Room is available so far.

Advice please. thanks

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Friday, June 13, 2014 10:23 AM
To: Nesky, Anthony
Cc: Diaz, Angelique; Herrenbruck, Glenna; Miller, Beth; Schultheisz, Daniel
Subject: RE: Dates when the Region 8 Hearing Room is available so far.

Tony,

I am leaning toward the 9/3-9/4 dates, but I have a few questions. Could you please explain what the contractor would be doing for us at the public hearing? Do we think these activities could be covered by us or Regional people? Is it possible we could request a 2 month no-cost extension of the work assignment? Thanks

Reid

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 5:38 PM
To: Rosnick, Reid
Subject: Dates when the Region 8 Hearing Room is available so far.

Dear Reid:

Angelique checked into the availability of the Region 8 hearing room. The absolute last day that we can use the contract support that we currently have is August 4; the contract ends on that date. I will be out of the country on vacation from August 8 through August 16.

Per Angelique, here are the dates when the Region 8 hearing room is available:

7/21 and 7/22
8/4 and 9/5
9/2 and 9/3
9/3 and 9/4

-Angelique

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Air Program, USEPA/Region 8
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Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 10:44 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Thanks for checking into this. I found out that the Reid will be on vacation the week of July 28. Could I trouble you to see what availability there is the week of July 14 and July 21st? That way, we'll have all our options open, and Reid can make a decision when he gets back tomorrow.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 12:40 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, we also have 9/2 and 9/3 or 9/3 and 9/4 as well. I thought I'd tell you since it's closer to your original dates. When Reid is back tomorrow let me know which you prefer the first week in August or the first week in September.

-Angelique

Angelique D. Diaz, Ph.D.
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Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 9:02 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Thank you for your help—and patience. I'm sorry that this process has become so drawn out.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 11:00 AM
To: Nesky, Anthony
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, I will reserve the rooms for 8/4 and 8/5. The max capacity is 60 people each day.

Angelique D. Diaz, Ph.D.
Environmental Engineer
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Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 8:45 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Reid is out until tomorrow. Could we go ahead and reserve the rooms, and cancel tomorrow if Reid isn't available those days. If that approach doesn't cause any problems for Region 8, please reserve the rooms. If it is a problem, we'll just have to wait until Reid is back.

Thanks again for all your support on these hearings!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 10:38 AM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

The only two consecutive days in a row in August available are 8/4 and 8/5. Let me know if these work because I'll have to reserve them ASAP before someone else gets them.

Thank you,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 11:52 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Angelique:

Thanks for all your help—I'm sorry this is proving to be such a hassle. We basically need to hold the meetings in August. Would it be possible to book any two consecutive days during the week of August 18? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Wednesday, June 11, 2014 12:55 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, there are no rooms available on those dates. I am having our scheduler check in August and September for rooms that are available for 2 days in a row. I'll let you know when I hear back from her.

-Angelique

Angelique D. Diaz, Ph.D.
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Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: Congressional Inquiry

From: Rosnick, Reid
Sent: Friday, June 13, 2014 11:22 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Cc: Lewis, Josh; Stahle, Susan
Subject: Congressional Inquiry

All,

Staff from Senator Udall (CO) have contacted our congressional office regarding issues with the Ute Mountain Ute tribe. The tribe contacted the Senator's office to discuss the Subpart W proposed rulemaking. I believe they will be expressing their disappointment with our consultation taking place after the rule was proposed. I explained to Josh Lewis that we would be available next week to speak to the staff regarding our communications with the tribe over the last 5 years.
Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: Congressional Inquiry

From: Edwards, Jonathan
Sent: Friday, June 13, 2014 11:27 AM
To: Rosnick, Reid
Subject: FW: Congressional Inquiry

FYI

From: Edwards, Jonathan
Sent: Friday, June 13, 2014 11:26 AM
To: Flynn, Mike
Subject: FW: Congressional Inquiry

Mike--- FYI. In fact, Reid has made a several year effort to connect in with stakeholders / tribes, including a visit to Blanding, Utah for a meeting at the Ute Mountain Ute community center. Will let you know more as things develop… --Jon

---

From: Rosnick, Reid
Sent: Friday, June 13, 2014 11:22 AM
To: Edwards, Jonathan; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Cc: Lewis, Josh; Stahle, Susan
Subject: Congressional Inquiry

All,

Staff from Senator Udall (CO) have contacted our congressional office regarding issues with the Ute Mountain Ute tribe. The tribe contacted the Senator's office to discuss the Subpart W proposed rulemaking. I believe they will be expressing their disappointment with our consultation taking place after the rule was proposed. I explained to Josh Lewis that we would be available next week to speak to the staff regarding our communications with the tribe over the last 5 years.
Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: call next week Tuesday or Wednesday?

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Friday, June 13, 2014 12:25 PM
To: Rosnick, Reid
Subject: RE: call next week Tuesday or Wednesday?

Sounds good

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, June 13, 2014 8:28 AM
To: Scott Clow
Cc: Colin Larrick; Celene Hawkins; Tomoe Natori; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: RE: call next week Tuesday or Wednesday?

Scott,

OK. I'll start checking for times in the 24th-26th time period.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Thursday, June 12, 2014 10:34 AM
To: Rosnick, Reid
Cc: clarrick@utemountain.org; Celene Hawkins; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: RE: call next week Tuesday or Wednesday?

Reid,
We are trying to get them finalized tomorrow (Friday) to send, but it may roll into Monday. Perhaps with that in mind we should scratch next Tuesday-Wednesday and aim for the 24-26th time frame. That will still give you a couple weeks before the consultation date to prepare.
SCott

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Thursday, June 12, 2014 4:20 AM
To: Scott Clow
Cc: Colin Larrick; Tomoe Natori; Michael King; 'mKeller@vancott.com'; Celene Hawkins; Mitre, Alfreda; Stahle, Susan; Peake, Tom; Childers, Pat; Harrison, Jed
Subject: RE: call next week Tuesday or Wednesday?

Hi Scott,

We would like to have the conference call with you as soon as practicable. However, we would like to have your questions in hand so we can discuss them with you during the call. Can you give me a better idea of when you will be able to transmit your questions? I would like at least a day or two to get them to EPA participants so we can discuss your concerns more effectively. Thanks.

I'll be away from my desk all day, in training, but I will check my email and voice mail at the end of the day. Thanks again.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Wednesday, June 11, 2014 6:31 PM
To: Rosnick, Reid
Cc: clarrick@utemountain.org; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Celene Hawkins; Mitre, Alfreda
Subject: call next week Tuesday or Wednesday?

HI Reid,
We are working on preparing the questions that we will want answers for at the upcoming consultation meeting. We are planning to have those to your team at EPA in the next few days.
We would like to schedule our second pre-consultation call to clarify the questions. We have availability next Tuesday (I can skip out of a little of my ROC meeting if necessary) or Wednesday afternoon. I think we could bump it into the following week, 24-26th but I will need to confirm that with our team. Please consider some dates.
Thanks,
Scott

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: Subpart W Public Hearing Room

From: Diaz, Angelique
Sent: Friday, June 13, 2014 1:13 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Trulove-Cranor, Whitney
Subject: Subpart W Public Hearing Room

Reid, rooms are reserved in the R8 building for 9/3 and 9/4. The 9/3 reservation holds 100 and the 9/4 holds 60 people.

-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: Subpart W Public Hearing Room

From: Rosnick, Reid
Sent: Friday, June 13, 2014 1:38 PM
To: Diaz, Angelique
Cc: Nesky, Anthony; Trulove-Cranor, Whitney
Subject: RE: Subpart W Public Hearing Room

Thank you!

From: Diaz, Angelique
Sent: Friday, June 13, 2014 1:13 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Trulove-Cranor, Whitney
Subject: Subpart W Public Hearing Room

Reid, rooms are reserved in the R8 building for 9/3 and 9/4. The 9/3 reservation holds 100 and the 9/4 holds 60 people.

-Angelique

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1595 Wynkoop Street (8P-AR)
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Fax: 303.312.6064
diaz.angelique@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:16 PM
To: Thornton, Marisa
Subject: FW: Comments to Docket

From: Rosnick, Reid
Sent: Friday, June 13, 2014 2:46 PM
To: sarah@uraniumwatch.org
Cc: Stahle, Susan; Peake, Tom; Schultheisz, Daniel
Subject: Comments to Docket

Hello Sarah,

I hope you are well. I wanted to let you know that I have received your emails concerning the Subpart W issues you have raised. Looking at the emails, I believe that these are comments from you specific to the Subpart W proposed rulemaking, and as such they belong in the dedicated Subpart W docket. Please submit your comments, identified by Docket ID No**. EPA-HQ-OAR-2008-0218**, to www.regulations.gov: Follow the on-line instructions for submitting comments. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm. Thanks.

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

www.ntaatribalair.org
928.523.0526 office
928.523.1266 fax

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004

June 12, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air
Radiation Protection Division
U.S. Environmental Protection Agency
Via email to rosnick.reid@epa.gov

Dear Mr. Rosnick,

The National Tribal Air Association (NTAA) is an autonomous organization with 80 principal member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of Indian Tribes. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions.

On behalf of the NTAA, I am writing to request that EPA extend the public comment period for the proposed rule issued in the Federal Register on May 2, 2014, which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings*". Specifically, the *NTAA is requesting the maximum comment extension period of 120 days*.

This rule addresses both conventional uranium milling operations as well as future extraction activities, namely in-situ leach/recovery (ISL) sites. Domestic uranium milling and mining operations to date have left in their wake a disturbing legacy of environmental injustice in Indian Country. As a national organization whose mission it is to advance air quality management and policies for federally recognized Tribes, it is only prudent that NTAA thoroughly evaluate the consequences of the proposed rule, including the potential impacts on Tribal communities, and subsequently provide comments to EPA. Given the serious complexity of the proposed rule, as well as the wide ranging implications for affected Tribes, we strongly request that you grant the aforementioned extension.

For our part, NTAA was only made aware of the proposed rule within the last two weeks. The public comment extension will help to promote a just and equitable public participation process by giving the NTAA, member Tribes, and those Tribes indicated on EPA's consultation list adequate time to examine the complex science and the associated human health considerations embodied in the proposed rule.

Sincerely,

Bill Thompson
Chairman, NTAA

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:19 PM
To: Thornton, Marisa
Subject: FW: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills
Attachments: NTAA_CommentExtReq_SubpartWRule.docx

-----Original Message-----
From: Cristina Gonzalez-Maddux [mailto:Cristina.Gonzalez-Maddux@nau.edu]
Sent: Thursday, June 12, 2014 12:17 PM
To: twalea@spokanetribe.com; Angela Benedict; air@lldrm.org; Bill.Thompson@Penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org
Cc: Childers, Pat; Mehrdad.Khatibi@NAU.EDU
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Twa-le, thank you for your email. I noticed that as well and was really surprised not to see Spokane Tribe on the list.

I made one minor edit to the document (attached). There were two places were the term "Tribe" was not capitalized. That's resolved now.

Best,

Cristina

Cristina Gonzalez-Maddux
Research Specialist
Institute for Tribal Environmental Professionals Northern Arizona University PO Box 15004 Flagstaff, AZ 86001-5768
Phone: (928) 523-8785
Fax: (928) 523-1280

-----Original Message-----
From: Twale Abrahamson [mailto:twalea@SpokaneTribe.com]
Sent: Thursday, June 12, 2014 8:37 AM
To: Cristina Gonzalez-Maddux; Angela Benedict; air@lldrm.org; Bill.Thompson@penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org;

greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org
Cc: childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Thanks Christina,

I see the Spokane Tribe isn't even on the consultation list and we have uranium and mill issues. We are passed the deadline according to the letter to request formal consultation, so we're all on board here to support/request the extension. I'll forward onto our legal to send and draft a letter as quickly as possible to request the extension as well.

Twa-le

Twa-le Abrahamson-Swan
Air Quality Coordinator
Spokane Tribal Natural Resources
www.spokanetribe.com/air-quality
509-626-4403
twalea@spokanetribe.com

From: Cristina Gonzalez-Maddux [Cristina.Gonzalez-Maddux@nau.edu]
Sent: Wednesday, June 11, 2014 5:43 PM
To: Angela Benedict; air@lldrm.org; Bill.Thompson@penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; Twale Abrahamson
Cc: childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Hello all,

Please find the modified public comment extension request attached. As always, edits and feedback are more than welcome. Once we have confirmation from the EC that you approve of the language in the letter, Andy will submit it to Mr. Rosnick.

I have attached the proposed rule for your reference. Also, here is some interesting information on the consultation process for the proposed rule:

See: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) - http://tcots.epa.gov/oita/tconsultation.nsf/TC?OpenView
> List of Tribes consulted and a copy of the letter that was sent to the
> Tribes

Thank you in advance for your response.

Respectfully,

Cristina

Cristina Gonzalez-Maddux
Research Specialist
Institute for Tribal Environmental Professionals Northern Arizona University PO Box 15004 Flagstaff, AZ 86001-5768
Phone: (928) 523-8785
Fax: (928) 523-1280

-----Original Message-----
From: Cristina Gonzalez-Maddux
Sent: Wednesday, June 11, 2014 8:38 AM
To: 'Angela Benedict'; air@lldrm.org; Bill.Thompson@penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Yes, Brandy and Angela, I absolutely agree with you about the need for a stronger argument in favor of the extension.

As Andy mentioned, we will (1) draft a more compelling argument for the extension, (2) specify the duration of the request, (3) add the language describing NTAA, (4) add the submission date to the top of the page, and lastly, get the new draft out today for final review.

Thank you to everyone for your feedback.

Best,

Cristina

Cristina Gonzalez-Maddux
Research Specialist
Institute for Tribal Environmental Professionals Northern Arizona University PO Box 15004 Flagstaff, AZ 86001-5768
Phone: (928) 523-8785
Fax: (928) 523-1280

-----Original Message-----
From: Angela Benedict [mailto:angela.benedict@srmt-nsn.gov]

Sent: Wednesday, June 11, 2014 7:30 AM
To: air@lldrm.org; Bill.Thompson@penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: Cristina Gonzalez-Maddux; childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

I agree with Brandy you really have to be specific of the terms you want or they will just push it aside.

Angela Benedict
Air Quality Program Manager
Saint Regis Mohawk Tribe Environment Division
412 State Route 37
Akwesasne, NY 13655
PH: 518-358-5937 ext 129
FX: 518-358-6252
website: www.srmtenv.org

"There's so much pollution in the air now that if it weren't for our lungs there'd be no place to put it all." Robert Orben quotes

-----Original Message-----
From: air@lldrm.org [mailto:air@lldrm.org]
Sent: Wednesday, June 11, 2014 9:30 AM
To: Bill.Thompson@penobscotnation.org; Andy.Bessler@nau.edu; Angela Benedict; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: Cristina.Gonzalez-Maddux@nau.edu; childers.pat@epa.gov; Mehrdad.Khatibi@nau.edu
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Andy/Cristina,

How long do you want the extension? 60 or 90 days. They will need/want that information. If you prose a problem, provide a solution.

Also put a date on the letter.

I would also put in a short section that describes NTAA as right now they don't understand that this letter represents 80+ members .

Argument is weak and may not be given a fair shake. Strengthen the argument with a few more sentences... NTAA just saw this, not well communicated in Indian Country, need time to share information on rule, provide invite to NTAA Policy call (again solution)...etc...

It will be too easy for them to push the letter aside as stated.

Brandy

Brandy Toft
Air Quality Specialist
Leech Lake Band of Ojibwe
218-335-7429

Knowledge is knowing a tomato is a fruit Wisdom is knowing not to put it in a fruit salad

---

From: Bill Thompson [Bill.Thompson@penobscotnation.org]
Sent: Wednesday, June 11, 2014 08:01 AM
To: Andy Bessler; Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Brandy Toft; Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com (katerenw@nc-cherokee.com); Kellie Poolaw (kelliej@pawneenation.org); Kevin Greenleaf (greenleaf@kootenai.org); lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); Ralph McCullers (rmccullers@pci-nsn.gov); randya@cskt.org (randya@cskt.org); rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com (twalea@spokanetribe.com)
Cc: Cristina Gonzalez-Maddux; Pat Childers (childers.pat@epa.gov); Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Nice catch there you two. I say send that boilerplate request on, but I don't have the only voice in this. What say ye others?

---Bill

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Tuesday, June 10, 2014 6:44 PM
To: Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Bill Thompson; Brandy Toft (air@lldrm.org); Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com (katerenw@nc-cherokee.com); Kellie Poolaw (kelliej@pawneenation.org); Kevin Greenleaf (greenleaf@kootenai.org); lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); Ralph McCullers (rmccullers@pci-nsn.gov); randya@cskt.org (randya@cskt.org); rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com (twalea@spokanetribe.com)
Cc: Cristina Gonzalez-Maddux; Pat Childers (childers.pat@epa.gov); Mehrdad - Khatibi
Subject: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Hello Everyone:

For those who were on last month's EPA Air Policy Update call, you might remember that someone mentioned the need to respond to a proposed EPA rule on Radon Emissions from Uranium Mills. Since the call, Cristina and I have done some research and have crafted a response that we would like to discuss on the EC call next week or secure email approve to proceed this week.

Basically, EPA recently issued a proposed rule for "Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings". The link for the rule is here: http://www.gpo.gov/fdsys/pkg/FR-2014-05-02/pdf/2014-09728.pdf

This rule may have important implications for Tribes throughout the nation, however, the short comment period leaves insufficient time for interested Tribes to submit meaningful comments. It's a complex rule that will no doubt require time to sort through prior to drafting informed, impactful comments. The current deadline is July 31, which is fast approaching. At this point, it seems like the most prudent action is to request a public comment period extension from EPA. Cristina drafted up a boiler plate request that with EC permission, we can submit as soon as possible.

In addition, we have asked an EPA contact identified in the rule to come onto the EPA Air Policy update call on June 26th to provide a briefing on the proposed rule. He has confirmed that he can present and will be included on the agenda.

Please take a look at the attached short letter and either provide your comments and feedback via email or if we don't hear any response, we will address it on the EC call coming up on June 16th.

Thanks so much!

Andy

Andy Bessler
Project Director
[cid:image001.jpg@01CF8553.BEF17A30]
National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org<http://www.ntaatribalair.org>

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:20 PM
To: Thornton, Marisa
Subject: FW: Congressional Inquiry

From: Rosnick, Reid
Sent: Thursday, June 12, 2014 9:30 AM
To: Peake, Tom; Schultheisz, Daniel
Cc: Edwards, Jonathan; Perrin, Alan
Subject: Congressional Inquiry

All,

I got a phone call from Josh Lewis in Congressional yesterday. Sen Udall (CO) staff contacted his office on behalf of the Ute Mt. Ute tribe regarding concerns they have with the Subpart W proposed rule. Josh suggested a phone call with the Senator's staff to address the concerns. I sent back a voice mail saying we would be happy to oblige, and that we have had a lot of contact with the tribe. I'll keep you posted.

Reid

____
Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:19 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 10:38 AM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

The only two consecutive days in a row in August available are 8/4 and 8/5. Let me know if these work because I'll have to reserve them ASAP before someone else gets them.

Thank you,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 11:52 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Angelique:

Thanks for all your help—I'm sorry this is proving to be such a hassle. We basically need to hold the meetings in August. Would it be possible to book any two consecutive days during the week of August 18? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Wednesday, June 11, 2014 12:55 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney

Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, there are no rooms available on those dates. I am having our scheduler check in August and September for rooms that are available for 2 days in a row. I'll let you know when I hear back from her.

-Angelique

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diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Whitney and Angelique:

We want to reschedule the hearings. Might you have rooms available on August 26-27?

Thanks, as always for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, May 19, 2014 4:13 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Voice Mail message

Tony, sorry for the additional e-mail, but the rooms we have on Monday, 6/16 hold 100 and on Tuesday, 6/17, the max is 60 people.

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Sent: Tuesday, September 02, 2014 4:19 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

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Sent: Thursday, June 12, 2014 11:00 AM
To: Nesky, Anthony
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, I will reserve the rooms for 8/4 and 8/5. The max capacity is 60 people each day.

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diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 8:45 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Reid is out until tomorrow. Could we go ahead and reserve the rooms, and cancel tomorrow if Reid isn't available those days. If that approach doesn't cause any problems for Region 8, please reserve the rooms. If it is a problem, we'll just have to wait until Reid is back.

Thanks again for all your support on these hearings!

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nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 10:38 AM
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Cc: Rosnick, Reid
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From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 11:52 AM
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Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Angelique:

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Tony Nesky
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Tel: 202-343-9597
nesky.tony@epa.gov

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Sent: Wednesday, June 11, 2014 12:55 PM
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From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:19 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 11:02 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Thank you for your help—and patience. I'm sorry that this process has become so drawn out.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 11:00 AM
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Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

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diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 8:45 AM
To: Diaz, Angelique
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

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Cc: Rosnick, Reid
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To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Whitney and Angelique:

We want to reschedule the hearings. Might you have rooms available on August 26-27?

Thanks, as always for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, May 19, 2014 4:13 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Voice Mail message

Tony, sorry for the additional e-mail, but the rooms we have on Monday, 6/16 hold 100 and on Tuesday, 6/17, the max is 60 people.

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Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Diaz, Angelique
Sent: Monday, May 19, 2014 1:25 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Voice Mail message

Tony, Whitney and I spoke and here are our comments/answers to the items below:

1. The max capacity for each session is 100.
2. Looks fine

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:19 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Diaz, Angelique
Sent: Thursday, June 12, 2014 11:02 AM
To: Nesky, Anthony
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Not a problem. Hopefully those dates work. If not, then we'll have to look at other locations in the Denver area.

Angelique D. Diaz, Ph.D.
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Fax: 303.312.6064
diaz.angelique@epa.gov

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Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

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To: Diaz, Angelique; Trulove-Cranor, Whitney
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Subject: RE: Voice Mail message

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Angelique D. Diaz, Ph.D.
Environmental Engineer

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:19 PM
To: Thornton, Marisa
Subject: FW: Need to put a memo in the Docket--is there a format?

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 11:27 AM
To: Lee, Raymond
Cc: Herrenbruck, Glenna
Subject: Need to put a memo in the Docket--is there a format?

Dear Ray:

I need to put a memo to file in the Docket and on the Subpart W website. The memo would document that a citizen's group requested a public hearing. Is there a format that we use? Do we put this on letterhead? Any advice would be appreciated.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:20 PM
To: Thornton, Marisa
Subject: FW: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills
Attachments: FR Rule SubW_.pdf; NTAA_CommentExtReq_SubpartWRule.docx

-----Original Message-----
From: Cristina Gonzalez-Maddux [mailto:Cristina.Gonzalez-Maddux@nau.edu]
Sent: Wednesday, June 11, 2014 8:43 PM
To: Angela Benedict; air@lldrm.org; Bill.Thompson@Penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: Childers, Pat; Mehrdad.Khatibi@NAU.EDU
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Hello all,

Please find the modified public comment extension request attached. As always, edits and feedback are more than welcome. Once we have confirmation from the EC that you approve of the language in the letter, Andy will submit it to Mr. Rosnick.

I have attached the proposed rule for your reference. Also, here is some interesting information on the consultation process for the proposed rule:

See: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) - http://tcots.epa.gov/oita/tconsultation.nsf/TC?OpenView
> List of Tribes consulted and a copy of the letter that was sent to the
> Tribes

Thank you in advance for your response.

Respectfully,

Cristina

Cristina Gonzalez-Maddux
Research Specialist

Institute for Tribal Environmental Professionals Northern Arizona University PO Box 15004 Flagstaff, AZ 86001-5768
Phone: (928) 523-8785
Fax: (928) 523-1280

-----Original Message-----
From: Cristina Gonzalez-Maddux
Sent: Wednesday, June 11, 2014 8:38 AM
To: 'Angela Benedict'; air@lldrm.org; Bill.Thompson@penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Yes, Brandy and Angela, I absolutely agree with you about the need for a stronger argument in favor of the extension.

As Andy mentioned, we will (1) draft a more compelling argument for the extension, (2) specify the duration of the request, (3) add the language describing NTAA, (4) add the submission date to the top of the page, and lastly, get the new draft out today for final review.

Thank you to everyone for your feedback.

Best,

Cristina

Cristina Gonzalez-Maddux
Research Specialist
Institute for Tribal Environmental Professionals Northern Arizona University PO Box 15004 Flagstaff, AZ 86001-5768
Phone: (928) 523-8785
Fax: (928) 523-1280

-----Original Message-----
From: Angela Benedict [mailto:angela.benedict@srmt-nsn.gov]
Sent: Wednesday, June 11, 2014 7:30 AM
To: air@lldrm.org; Bill.Thompson@penobscotnation.org; Andy Bessler; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: Cristina Gonzalez-Maddux; childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

I agree with Brandy you really have to be specific of the terms you want or they will just push it aside.

Angela Benedict
Air Quality Program Manager
Saint Regis Mohawk Tribe Environment Division
412 State Route 37
Akwesasne, NY 13655
PH: 518-358-5937 ext 129
FX: 518-358-6252
website: www.srmtenv.org

"There's so much pollution in the air now that if it weren't for our lungs there'd be no place to put it all." Robert Orben quotes

-----Original Message-----
From: air@lldrm.org [mailto:air@lldrm.org]
Sent: Wednesday, June 11, 2014 9:30 AM
To: Bill.Thompson@penobscotnation.org; Andy.Bessler@nau.edu; Angela Benedict; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; twalea@spokanetribe.com
Cc: Cristina.Gonzalez-Maddux@nau.edu; childers.pat@epa.gov; Mehrdad.Khatibi@nau.edu
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Andy/Cristina,

How long do you want the extension? 60 or 90 days. They will need/want that information. If you prose a problem, provide a solution.

Also put a date on the letter.

I would also put in a short section that describes NTAA as right now they don't understand that this letter represents 80+ members .

Argument is weak and may not be given a fair shake. Strengthen the argument with a few more sentences... NTAA just saw this, not well communicated in Indian Country, need time to share information on rule, provide invite to NTAA Policy call (again solution)...etc...

It will be too easy for them to push the letter aside as stated.

Brandy

Brandy Toft
Air Quality Specialist
Leech Lake Band of Ojibwe
218-335-7429

Knowledge is knowing a tomato is a fruit Wisdom is knowing not to put it in a fruit salad

____
From: Bill Thompson [Bill.Thompson@penobscotnation.org]
Sent: Wednesday, June 11, 2014 08:01 AM
To: Andy Bessler; Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Brandy Toft; Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com (katerenw@nc-cherokee.com); Kellie Poolaw (kelliej@pawneenation.org); Kevin Greenleaf (greenleaf@kootenai.org); lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); Ralph McCullers (rmccullers@pci-nsn.gov); randya@cskt.org (randya@cskt.org); rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com (twalea@spokanetribe.com)
Cc: Cristina Gonzalez-Maddux; Pat Childers (childers.pat@epa.gov); Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Nice catch there you two. I say send that boilerplate request on, but I don't have the only voice in this. What say ye others?

---Bill

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Tuesday, June 10, 2014 6:44 PM
To: Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Bill Thompson; Brandy Toft (air@lldrm.org); Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com (katerenw@nc-cherokee.com); Kellie Poolaw (kelliej@pawneenation.org); Kevin Greenleaf (greenleaf@kootenai.org); lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); Ralph McCullers (rmccullers@pci-nsn.gov); randya@cskt.org (randya@cskt.org); rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com (twalea@spokanetribe.com)
Cc: Cristina Gonzalez-Maddux; Pat Childers (childers.pat@epa.gov); Mehrdad - Khatibi
Subject: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Hello Everyone:

For those who were on last month's EPA Air Policy Update call, you might remember that someone mentioned the need to respond to a proposed EPA rule on Radon Emissions from Uranium Mills. Since the call, Cristina and I have done some research and have crafted a response that we would like to discuss on the EC call next week or secure email approve to proceed this week.

Basically, EPA recently issued a proposed rule for "Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings". The link for the rule is here: http://www.gpo.gov/fdsys/pkg/FR-2014-05-02/pdf/2014-09728.pdf

This rule may have important implications for Tribes throughout the nation, however, the short comment period leaves insufficient time for interested Tribes to submit meaningful comments. It's a complex rule that will no doubt require time to sort through prior to drafting informed, impactful comments. The current deadline is July 31, which is fast approaching. At this point, it seems like the most prudent action is to request a public comment period extension from EPA. Cristina drafted up a boiler plate request that with EC permission, we can submit as soon as possible.

In addition, we have asked an EPA contact identified in the rule to come onto the EPA Air Policy update call on June 26th to provide a briefing on the proposed rule. He has confirmed that he can present and will be included on the agenda.

Please take a look at the attached short letter and either provide your comments and feedback via email or if we don't hear any response, we will address it on the EC call coming up on June 16th.

Thanks so much!

Andy

Andy Bessler
Project Director
[cid:image001.jpg@01CF8553.BEF17A30]
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Part III

Environmental Protection Agency

40 CFR Part 61

Revisions to National Emission Standards for Radon Emissions from Operating Mill Tailings; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 61

[EPA–HQ–OAR–2008–0218; FRL–9816–2]

RIN 2060–AP26

Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: The Environmental Protection Agency (EPA) is proposing to revise certain portions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radon emissions from operating uranium mill tailings. The proposed revisions are based on EPA's determination as to what constitutes generally available control technology or management practices (GACT) for this area source category. We are also proposing to add new definitions to this rule, revise existing definitions and clarify that the rule applies to uranium recovery facilities that extract uranium through the in-situ leach method and the heap leach method.

DATES: Comments must be received on or before July 31, 2014.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OAR–2008–0218, by one of the following methods:

- *www.regulations.gov*: Follow the on-line instructions for submitting comments.
- *Email: a-and-r-docket@epa.gov.*
- *Fax:* 202–566–9744.
- *Mail:* Air and Radiation Docket, Environmental Protection Agency, Mailcode: 2822T, 1200 Pennsylvania Ave. NW., Washington, DC 20460.
- *Hand Delivery:* EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OAR–2008–0218. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *www.regulations.gov*, including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *www.regulations.gov* or email. The *www.regulations.gov* Web site is an ''anonymous access'' system, which means EPA will not know your identity or contact information unless you provide it in the body of your comment. If you send an email comment directly to EPA without going through *www.regulations.gov* your email address will be automatically captured and included as part of the comment that is placed in the public docket and made available on the Internet. If you submit an electronic comment, EPA recommends that you include your name and other contact information in the body of your comment and with any disk or CD–ROM you submit. If EPA cannot read your comment due to technical difficulties and cannot contact you for clarification, EPA may not be able to consider your comment. Electronic files should avoid the use of special characters, any form of encryption, and be free of any defects or viruses. For additional information about EPA's public docket visit the EPA Docket Center homepage at *http://www.epa.gov/epahome/dockets.htm.*

Docket: All documents in the docket are listed in the *www.regulations.gov* index. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in *www.regulations.gov* or in hard copy at the Office of Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Air and Radiation Docket is (202) 566–1792.

FOR FURTHER INFORMATION CONTACT: Reid J. Rosnick, Office of Radiation and Indoor Air, Radiation Protection Division, Mailcode 6608J, U.S. Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460; telephone number: 202–343–9290; fax number: 202–343–2304; email address: *rosnick.reid@epa.gov.*

SUPPLEMENTARY INFORMATION:

Outline. The information in this preamble is organized as follows:

I. General Information

A. Does this action apply to me?

The regulated categories and entities potentially affected by the proposed standards include:

Category	NAICS code [1]	Examples of regulated entities
Industry:		
Uranium Ores Mining and/or Beneficiating	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.
Leaching of Uranium, Radium or Vanadium Ores	212291	Area source facilities that extract or concentrate uranium from any ore processed primarily for its source material content.

[1] North American Industry Classification System.

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this proposed action. If you have any questions regarding the applicability of this action to a particular entity, consult either the air permit authority for the entity or your EPA regional representative as listed in 40 CFR 61.04 of subpart A (General Provisions).

B. What should I consider as I prepare my comments for EPA?

1. *Submitting CBI.* Do not submit this information to EPA through *www.regulations.gov* or email. Clearly mark the part or all of the information that you claim to be CBI. For CBI information in a disk or CD ROM that you mail to EPA, mark the outside of the disk or CD ROM as CBI and then identify electronically within the disk or CD ROM the specific information that is claimed as CBI. In addition to one complete version of the comment that includes information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public docket. Information marked as CBI will not be disclosed except in accordance with procedures set forth in 40 CFR part 2.

2. *Tips for Preparing Your Comments.* When submitting comments, remember to:

- Identify the rulemaking by docket number and other identifying information (subject heading, **Federal Register** date and page number).
- Follow directions—The agency may ask you to respond to specific questions or organize comments by referencing a Code of Federal Regulations (CFR) part or section number.
- Explain why you agree or disagree, suggest alternatives, and substitute language for your requested changes.
- Describe any assumptions and provide any technical information and/or data that you used.
- If you estimate potential costs or burdens, explain how you arrived at your estimate in sufficient detail to allow for it to be reproduced.
- Provide specific examples to illustrate your concerns, and suggest alternatives.
- Explain your views as clearly as possible, avoiding the use of profanity or personal threats.

Make sure to submit your comments by the comment period deadline identified.

C. Acronyms and Abbreviations

We use many acronyms and abbreviations in this document. These include:

AEA—Atomic Energy Act
ALARA—As low as reasonably achievable
BID—Background information document
CAA—Clean Air Act
CAAA—Clean Air Act Amendments of 1990
CCAT—Colorado Citizens Against Toxic Waste
CFR—Code of Federal Regulations
Ci—Curie, a unit of radioactivity equal to the amount of a radioactive isotope that decays at the rate of 3.7×10^{10} disintegrations per second.
DOE—U.S. Department of Energy
EIA—economic impact analysis
EO—Executive Order
EPA—U.S. Environmental Protection Agency
FR—Federal Register
GACT—Generally Available Control Technology
gpm—Gallons Per Minute
HAP—Hazardous Air Pollutant
ICRP—International Commission on Radiological Protection
ISL—In-situ leach uranium recovery, also known as in-situ recovery (ISR)
LCF—Latent Cancer Fatality—Death resulting from cancer that became active after a latent period following exposure to radiation
NAAQS—National Ambient Air Quality Standards
NCRP—National Council on Radiation Protection and Measurements
mrem—millirem, 1×10^{-3} rem
MACT—Maximum Achievable Control Technology
NESHAP—National Emission Standard for Hazardous Air Pollutants
NRC—U.S. Nuclear Regulatory Commission
OMB—Office of Management and Budget
pCi—picocurie, 1×10^{-12} curie
Ra-226—Radium-226
Rn-222—Radon-222
Radon flux—A term applied to the amount of radon crossing a unit area per unit time, as in picocuries per square centimeter per second (pCi/m^2/sec).
RCRA—Resource Conservation and Recovery Act
Subpart W—National Emission Standards for Radon Emissions from Operating Mill Tailings at 40 CFR 61.250–61.256
TEDE—Total Effective Dose Equivalent
UMTRCA—Uranium Mill Tailings Radiation Control Act of 1978
U.S.C.—United States Code

D. Where can I get a copy of this document?

In addition to being available in the docket, an electronic copy of this proposed action will also be available on the Worldwide Web (WWW) through the Technology Transfer Network (TTN). Following signature, a copy of this proposed action will be posted on the TTN's policy and guidance page for newly proposed or promulgated rules at the following address: *http://www.epa.gov/ttn/oarpg/.* The TTN provides information and technology exchange in various areas of air pollution control.

E. When would a public hearing occur?

If anyone contacts EPA requesting to speak at a public hearing concerning this proposed rule by July 1, 2014, we will hold a public hearing. If you are interested in attending the public hearing, contact Mr. Anthony Nesky at (202) 343–9597 to verify that a hearing will be held and if you wish to speak. If a public hearing is held, we will announce the date, time and venue on our Web site at *http://www.epa.gov/radiation.*

II. Background Information for Proposed Area Source Standards

A. What is the statutory authority for the proposed standards?

Section 112(q)(1) of the Clean Air Act (CAA) requires that National Emission Standards for Hazardous Air Pollutants (NESHAP) ''in effect before the date of enactment of the Clean Air Act Amendments of 1990 [Nov. 15, 1990] . . . shall be reviewed and, if appropriate, revised, to comply with the requirements of subsection (d) of . . . section [112].'' EPA promulgated 40 CFR part 61, Subpart W, ''National Emission Standards for Radon Emissions From Operating Mill Tailings,'' (''Subpart W'') on December 15, 1989.[1] EPA is conducting this review of Subpart W under CAA section 112(q)(1) to determine what revisions, if any, are appropriate.

Section 112(d) of the CAA requires EPA to establish emission standards for major and area source categories that are listed for regulation under CAA section 112(c). A major source is any stationary source that emits or has the potential to emit 10 tons per year (tpy) or more of any single hazardous air pollutant (HAP) or 25 tpy or more of any combination of HAP. An area source is a stationary source of HAP that is not a major source. For the purposes of Subpart W, the HAP at issue is radon-222 (hereafter referred to as ''radon''). We presently have no data or information that shows any other HAPs being emitted from these impoundments. Calculations of radon emissions from operating uranium recovery facilities have shown that facilities regulated under Subpart W are area sources (EPA–HQ–OAR–2008–0218–0001, 0002).

Section 112(q)(1) does not dictate how EPA must conduct its review of those NESHAPs issued prior to 1990. Rather, it provides that the Agency must review, and if appropriate, revise the standards to comply with the requirements of section 112(d). Determining what revisions, if any, are appropriate for these NESHAPs is best assessed through a case-by-case consideration of each NESHAP. As explained below, in this case, we have reviewed Subpart W and are revising the standards consistent with section 112(d)(5), which provides EPA authority to issue standards for area sources.

Under CAA section 112(d)(5), the Administrator may elect to promulgate standards or requirements for area sources ''which provide for the use of generally available control technologies or management practices by such sources to reduce emissions of hazardous air pollutants.'' Under section 112(d)(5), the Administrator has the discretion to use generally available control technology or management practices (GACT) in lieu of maximum achievable control technology (MACT) under section 112(d)(2) and (d)(3), which is required for major sources. Pursuant to section 112(d)(5), we are proposing revisions to Subpart W to reflect GACT.

B. What criteria did EPA use in developing the proposed GACT standards for these area sources?

Additional information on generally available control technologies or management practices (GACT) is found in the Senate report on the legislation (Senate Report Number 101–228, December 20, 1989), which describes GACT as:

> * * * methods, practices and techniques which are commercially available and appropriate for application by the sources in the category considering economic impacts and the technical capabilities of the firms to operate and maintain the emissions control systems.

Consistent with the legislative history, we can consider costs and economic impacts in determining GACT, which is particularly important when developing regulations for source categories, like this one, that may include small businesses.

Determining what constitutes GACT involves considering the control technologies and management practices that are generally available to the area sources in the source category. We also consider the standards applicable to major sources[2] in the same industrial sector to determine if the control technologies and management practices are transferable and generally available to area sources. In appropriate circumstances, we may also consider technologies and practices at area and major sources in similar categories to determine whether such technologies and practices could be considered generally available for the area source category at issue. Finally, as noted above, in determining GACT for a particular area source category, we consider the costs and economic impacts of available control technologies and management practices on that category.

C. What source category is affected by the proposed standards?

As defined by EPA pursuant to the CAA, the source category for Subpart W is ''facilities licensed [by the U.S. Nuclear Regulatory Commission (NRC)] to manage uranium byproduct material during and following the processing of uranium ores, commonly referred to as uranium mills and their associated tailings.'' 40 CFR 61.250. Subpart W defines ''uranium byproduct material or tailings'' as ''the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.''[3] 40 CFR 61.251(g). For clarity, in this proposed rule we refer to this source category by the term ''uranium recovery facilities'' and we are proposing to add this phrase to the definitions section of the rule. Use of this term encompasses the existing universe of facilities whose HAP emissions are currently regulated under Subpart W. Uranium recovery facilities process uranium ore to extract uranium. The HAP emissions from any type of uranium recovery facility that manages uranium byproduct material or tailings is subject to regulation under Subpart W. This currently includes three types of uranium recovery facilities: (1) Conventional uranium mills; (2) in-situ leach recovery facilities; and (3) heap leach facilities. Subpart W requirements specifically apply to the affected sources at the uranium recovery facilities that are used to manage or contain the uranium byproduct material or tailings. Common names for these structures may include, but are not limited to, impoundments, tailings impoundments, evaporation or holding ponds, and heap leach piles. However, the name itself is not important for determining whether Subpart W requirements apply to that structure; rather, applicability is based

[1] On April 26, 2007, Colorado Citizens Against Toxic Waste and Rocky Mountain Clean Air Action filed a lawsuit against EPA (EPA–HQ–OAR–2008–0218–0013) for EPA's alleged failure to review and, if appropriate, revise NESHAP Subpart W under CAA section 112(q)(1). A settlement agreement was entered into between the parties in November 2009(EPA–HQ–OAR–2008–0218–0019).

[2] None of the sources in this source category are major sources.

[3] Pursuant to the Atomic Energy Act of 1954, as amended, the Nuclear Regulatory Commission defines ''source material'' as ''(1) Uranium or thorium or any combination of uranium or thorium in any chemical or physical form; or (2) Ores that contain, by weight, one-twentieth of one percent (0.05 percent), or more, of uranium or thorium, or any combination of uranium or thorium.'' (10 CFR 20.1003) For a uranium recovery facility licensed by the Nuclear Regulatory Commission under 10 CFR Part 40, ''byproduct material'' means the ''tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes.'' (10 CFR 20.1003 and 40.4)

on the use of these structures to manage or contain uranium byproduct material.

D. What are the production operations, emission sources, and available controls?

As noted above, uranium recovery and processing currently occurs by one of three methods: (1) Conventional milling; (2) in-situ leach (ISL); and (3) heap leach. Below we present a brief explanation of the various uranium recovery methods and the usual structures that contain uranium byproduct materials.

(1) Conventional Mills

Conventional milling is one of the two primary recovery methods that are currently used to extract uranium from uranium-bearing ore. Conventional mills are typically located in areas of low population density. Only one conventional mill in the United States is currently operating; all others are in standby, in decommissioning (closure) or have been decommissioned.

A conventional uranium mill is a chemical plant that extracts uranium using the following process:

(A) Trucks deliver uranium ore to the mill, where it is crushed before the uranium is extracted through a leaching process. In most cases, sulfuric acid is the leaching agent, but alkaline solutions can also be used to leach the uranium from the ore. The process generally extracts 90 to 95 percent of the uranium from the ore.

(B) The mill then concentrates the extracted uranium to produce a uranium oxide material which is called ''yellowcake'' because of its yellowish color.[4]

(C) Finally, the yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

(D) The extraction process in (A) and (B) above produces both solid and liquid wastes (i.e., uranium byproduct material, or ''tailings'') which are transported from the extraction location to an on-site tailings impoundment or a pond for temporary storage.

Uranium byproduct material/tailings are typically created in slurry form during the crushing, leaching and concentration processes and are then deposited in an impoundment or ''mill tailings pile'' which must be carefully monitored and controlled. This is because the mill tailings contain heavy metal ore constituents, including radium. The radium decays to produce radon, which may then be released to the environment. Because radon is a radioactive gas which may be inhaled into the respiratory tract, EPA has determined that exposure to radon and its daughter products contributes to an increased risk of lung cancer.[5]

The holding or evaporation ponds at this type of facility hold liquids containing byproduct material from which HAP emissions are also regulated under Subpart W. These ponds are discussed in more detail in the next section.

(2) In-Situ Leach/Recovery

In-situ leach or recovery sites (ISL/ISR, in this document we will use ISL) represent the majority of the uranium recovery operations that currently exist. The research and development projects and associated pilot projects of the 1980s demonstrated ISL as a viable uranium recovery technique where site conditions (e.g., geology) are amenable to its use. Economically, this technology produces a better return on the investment dollar (EPA–HQ–OAR–2008–0218–0087); therefore, the cost to produce uranium is more favorable to investors. Due to this, the trend in uranium production has been toward the ISL process.

In-situ leaching is defined as the underground leaching or recovery of uranium from the host rock (typically sandstone) by chemicals, followed by recovery of uranium at the surface. Leaching, or more correctly the re-mobilization of uranium into solution, is accomplished through the underground injection of a lixiviant (described below) into the host rock (i.e., ore body) through wells that are connected to the ore formation. A lixiviant is a chemical solution used to extract (or leach) uranium from underground ore bodies.

The injection of a lixiviant essentially reverses the geochemical reactions that resulted in the formation of the uranium deposit. The lixiviant assures that the dissolved uranium, as well as other metals, remains in the solution while it is collected from the ore zone by recovery wells, which pump the solution to the surface. At the surface, the uranium is recovered in an ion-exchange column and further processed into yellowcake. The yellowcake is packaged and transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

Two types of lixiviant solutions can be used, loosely defined as ''acid'' or ''alkaline'' systems. In the U.S., the geology and geochemistry of the majority of the uranium ore bodies favors the use of alkaline lixiviants such as bicarbonate-carbonate lixiviant and oxygen. Other factors in the choice of the lixiviant are the uranium recovery efficiencies, operating costs, and the ability to achieve satisfactory ground-water restoration.

After processing, lixiviant is recharged (more carbonate/bicarbonate or dissolved carbon dioxide is added to the solution) and pumped back down into the formation for reuse in extracting more uranium. However, a small amount of this liquid is held back from reinjection to maintain a proper hydraulic gradient[6] within the wellfield. The amount of liquid held back is a function of the characteristics of the formation properties (e.g., permeability, hydraulic conductivity, transmissivity). This excess liquid is sent to an impoundment (often called an evaporation pond or holding pond) on site or injected into a deep well for disposal. These impoundments, since they contain uranium byproduct material, are subject to the requirements of Subpart W.[7] With respect to the lixiviant reinjected into the wellfield, there is a possibility of the lixiviant spreading beyond the zone of the uranium deposit (excursion), and this produces a threat of ground-water contamination. The operator of the ISL facility remediates any excursion by pumping large amounts of water in or out of the formation (at various wells) to contain the excursion, and this water (often containing byproduct material either before or after injection into or withdrawal from the formation) is often stored in the evaporation or holding ponds.[8] Although the excursion control operation itself is not regulated under Subpart W, the ponds that contain byproduct material are regulated under that subpart, since they are a potential source of radon emissions. After the ore body has been depleted, restoration of the formation (attempting to return the formation back to its original geochemical and geophysical

[4] The term ''yellowcake'' is still commonly used to refer to this material, although in addition to yellow the uranium oxide material can also be black or grey in color.

[5] *http://www.epa.gov/radon/risk_assessment.html*.

[6] The hydraulic gradient determines which direction water in the formation will flow, which in this case limits the amount of water that migrates away from the ore zone.

[7] As described later in this preamble, the design requirements for these impoundments are derived from the RCRA requirements for impoundments.

[8] By controlling the hydraulic gradient of the formation the operator controls the direction of flow of water, containing the water within specified limits of the formation.

properties) is accomplished by flushing the host rock with water and sometimes additional chemicals. Since small amounts of uranium are still contained in the returning water, the restoration fluids are also considered byproduct material, and are usually sent to evaporation ponds for disposition.

(3) Heap Leaching

In addition to conventional uranium milling and ISL, some facilities may use an extraction method known as heap leaching. In some instances uranium ore is of such low grade, or the geology of the ore body is such that it is not cost-effective to remove the uranium via conventional milling or through ISL.[9] In this case a heap leaching method may be utilized.

No such facilities currently operate to recover uranium in the U.S. However, there are plans for at least one facility to open in the U.S. within the next few years.

Heap leach operations involve the following process:

A. Small pieces of ore are placed in a large pile, or ''heap,'' on an impervious geosynthetic liner with perforated pipes under the heap. For the purposes of Subpart W the impervious pad will meet the requirements for design and construction of impoundments found at 40 CFR 192.32(a).

B. An acidic solution is then sprayed[10] over the ore to dissolve the uranium it contains.

C. The uranium-rich solution drains into the perforated pipes, where it is collected and transferred to an ion-exchange system.

D. The heap is ''rested,'' meaning that there is a temporary cessation of application of acidic solution to allow for oxidation of the ore before leaching begins again.

E. The ion-exchange system extracts the uranium from solution where it is later processed into a yellowcake.[11]

F. Once the uranium has been extracted, the remaining solution still contains small amounts of uranium byproduct material (the extraction process is not 100% effective), and this solution is either piped to the heap leach pile to be reused or piped to an evaporation or holding pond. In the evaporation pond it is subject to the Subpart W requirements.

G. The yellowcake is transported to a uranium conversion facility where it is processed through the stages of the nuclear fuel cycle to produce fuel for use in nuclear power reactors.

H. Finally, there is a final drain down of the heap solutions, as well as a possible rinsing of the heap. These solutions will contain byproduct material and will be piped to evaporation or holding ponds, where they become subject to the Subpart W requirements. The heap leach pile will be closed in place according to the requirements of 40 CFR 192.32.

Today we are proposing to regulate the HAP emissions from heap leach uranium extraction under Subpart W, in addition to conventional impoundments and evaporation ponds, which are already regulated under this Subpart. Our rationale (explained in greater detail in Section IV.D.4.) is that from the moment uranium extraction takes place in the heap, uranium byproduct material is left behind. Therefore the byproduct material must be managed with the same design as a conventional impoundment, with a liner and leak detection system prescribed at 40 CFR 192.32(a), and an effective method of limiting radon emissions while the heap leach pile is being used to extract uranium.

As described above, there may also be holding or evaporation ponds at this type of facility. In many cases these ponds hold liquids containing byproduct material. The byproduct material is contained in the liquids used to leach uranium from the ore in the heap leach pile as well as draining the heap leach pile in preparation for closure. The HAP emissions from these fluids are currently regulated under Subpart W.

E. What are the existing requirements under Subpart W?

Subpart W was promulgated on December 15, 1989 (54 FR 51654). At the time of promulgation the predominant form of uranium recovery was through the use of conventional mills. There are two separate standards required in Subpart W. The first standard is for ''existing'' impoundments, e.g., those in existence and licensed by the NRC (or it's Agreement States) on or prior to December 15, 1989. Owners or operators of existing tailings impoundments must ensure that emissions from those impoundments do not exceed a radon (Rn-222) flux standard of 20 picocuries per meter squared per second ($pCi/m^2/sec$). As stated at the time of promulgation: ''This rule will have the practical effect of requiring the mill owners to keep their piles wet or covered.''[12] Keeping the piles (impoundments) wet or covered with soil would reduce radon emissions to a level that would meet the standard. This is still considered an effective method to reduce radon emissions at all uranium tailings impoundments.

The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. The owners or operators of existing impoundments must report to EPA the results of the compliance testing for any calendar year by no later than March 31 of the following year.

There is currently one existing operating mill with impoundments that pre-date December 15, 1989, and two mills that are currently in standby mode.

The second standard applies to ''new'' impoundments designed and/or constructed after December 15, 1989. The requirements applicable to new impoundments are work practice standards that regulate either the size and number of impoundments, or the amount of tailings that may remain uncovered at any time. 40 CFR 61.252(b) states that no new tailings impoundment can be built after December 15, 1989, unless it is designed, constructed and operated to meet one of the following two work practices:

1. Phased disposal in lined impoundments that are no more than 40 acres in area, and meet the requirements of 40 CFR 192.32(a) as determined by the NRC. The owner or operator shall have no more than two impoundments, including existing impoundments, in operation at any one time.

2. Continuous disposal of tailings that are dewatered and immediately disposed with no more than 10 acres uncovered at any time, and operated in accordance with 40 CFR 192.32(a) as determined by the NRC.

The basis of the work practice standards is to (1) limit the size of the impoundment, which limits the radon source; or (2) utilize the continuous disposal system, which prohibits large accumulations of uncovered tailings, limiting the amount of radon released.

The work practice standards described above were promulgated after EPA considered a number of factors that influence the emissions of Rn-222 from tailings impoundments, including the climate and the size of the impoundment. For example, for a given concentration of Ra-226 in the tailings, and a given grain size of the tailings, the moisture content of the tailings will control the radon emission rate; the higher the moisture content the lower the emission rate. In the arid and semi-arid areas of the country where most impoundments are located or proposed, the annual evaporation rate is quite high. As a result, the exposed tailings

[9] The ore grade is so low that it is not practical to invest large sums of capital to extract the uranium. Heap leach is a much more passive and relatively inexpensive system.

[10] Other technology includes drip systems, sometimes used at gold extraction heaps, and flooding of the heap leach pile.

[11] It is our understanding that either ion-exchange or solvent extraction techniques can be used to recover uranium at heap leach facilities. The decision to use one type or the other depends largely on the quality of the ore at a particular site.

[12] See 54 FR 51689.

(absent controls like sprinkling) dry rapidly. In previous assessments, we explicitly took the fact of rapid drying into account by using a Rn-222 flux rate of 1 pCi/m^2/s per pCi/g Ra-226 to estimate the Rn-222 source term from the dry areas of the impoundments. (**Note:** The estimated source terms from the ponded (areas completely covered by liquid) and saturated areas of the impoundments are considered to be zero, reflecting the complete attenuation of the Rn-222).

Another factor we considered was the area of the impoundment, which has a direct linear relationship with the Rn-222 source term, more so than the depth or volume of the impoundment. Again, assuming the same Ra-226 concentration and grain sizes in the tailings, a 100-acre dry impoundment will emit 10 times the radon of a 10-acre dry impoundment. This linear relationship between size and Rn-222 source term is one of the main reasons that Subpart W imposed size restrictions on all future impoundments (40 acres per impoundment if phased disposal is chosen and 10 acres total uncovered if continuous disposal is chosen).

Subpart W also mandates that all tailings impoundments at uranium recovery facilities comply with the requirements at 40 CFR 192.32(a). EPA explained the reason for adding this requirement in the preamble as follows:

> ''EPA recognizes that in the case of a tailings pile which is not synthetically or clay lined (the clay lining can be the result of natural conditions at the site) water placed on the tailings in an amount necessary to reduce radon levels, can result in ground water contamination. In addition, in certain situations the water can run off and contaminate surface water. EPA cannot allow a situation where the reduction of radon emissions comes at the expense of increased pollution of the ground or surface water. Therefore, all piles will be required to meet the requirements of 40 CFR 192.32(a) which protects water supplies from contamination. Under the current rules, existing piles are exempt from these provisions, this rule will end that exemption.''

54 FR 51654, 51680 (December 15, 1989). Therefore, all impoundments are required to meet the requirements at 40 CFR 192.32(a).

Section 192.32(a) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. Briefly, 40 CFR 264.221(c) requires that the liner system must include:

1. A top liner designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into the liner during the active life of the unit.
2. A composite bottom liner consisting of at least two components. The upper component must be designed and constructed of materials (e.g., a geomembrane) to prevent the migration of hazardous constituents into this component during the active life of the unit. The lower component must be designed and constructed of materials to minimize the migration of hazardous constituents if a breach in the upper component were to occur. The lower component must be constructed of at least three feet of compacted soil material with a hydraulic conductivity of no more than 1×10^{7} cm/sec.
3. A leachate collection and removal system between the liners, which acts as a leak detection system. This system must be capable of detecting, collecting and removing hazardous constituents at the earliest practicable time through all areas of the top liner likely to be exposed to the waste or liquids in the impoundment.

There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.[13]

F. How did we gather information for this proposed rule?

This section describes the information we used as the basis for making the determination to revise Subpart W. We collected this information using various methods. We performed literature searches, where appropriate, of the engineering methods used by existing uranium recovery facilities in the United States as well as the rest of the world. We used this information to determine whether the technology used to contain uranium byproduct material had advanced since the time of the original promulgation of Subpart W. We reviewed and compiled a list of existing and proposed uranium recovery facilities and the containment technologies being used, as well as those proposed to be used. We compared and contrasted those technologies with the engineering requirements of hazardous waste surface impoundments regulated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), which are used as the design basis for existing uranium byproduct material impoundments.

We collected information on existing uranium mills and in-situ leach facilities by issuing information collection requests authorized under section 114(a) of the CAA to seven uranium recovery facilities. At the time, this represented 100% of existing facilities. Since then, Cotter Corp. has closed its Cañon City facility. These requests required uranium recovery companies to provide detailed information about the uranium mill and/or in-situ leaching facility, as well as the number, sizes and types of affected sources (tailings impoundments, evaporation ponds and collection ponds) that now or in the past held uranium byproduct material. We requested information on the history of operation since 1975, ownership changes, whether the operation was in standby mode and whether plans existed for new facilities or reactivated operations were expected.[14] We also reviewed the regulatory history of Subpart W and the radon measurement methods used to determine compliance with the existing standards. Below is a synopsis of the information we collected and our analyses.

1. Pre-1989 Conventional Mill Impoundments

We have been able to identify three facilities, either operating or on standby,[15] that have been in operation since before the promulgation of Subpart W in 1989. These existing facilities must ensure that emissions from their operational, pre-1989 impoundments[16] not exceed a radon (Rn-222) flux standard of 20 pCi/m^2/sec. The method for monitoring for compliance with the radon flux standard was prescribed as Method 115, found at 40 CFR part 61, Appendix B. These facilities must also meet the requirements in 40 CFR 61.252(c), which cross-references the requirements of 40 CFR 192.32(a)

The White Mesa Conventional Mill in Blanding, Utah, has one pre-1989 impoundment (known by the company as Cell 3) that is currently in operation and near capacity but is still authorized and continues to receive tailings. The

[13] For detailed information on the design and operating requirements, refer to 40 CFR Part 264 Subpart K—Surface Impoundments.

[14] Section 114(a) letters and responses can be found at *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[15] ''Standby'' is when a facility impoundment is licensed for the continued placement of tailings/byproduct material but is currently not receiving tailings/byproduct material. See Section V.A. for a discussion of this definition that we are proposing to add to Subpart W.

[16] In this preamble when we use the generic term ''impoundment,'' we are using the term as described by industry.

company is now pumping any residual free solution out of the cell and contouring the sands. It will then be determined whether any more solids need to be added to the cell to fill it to the specified final elevation. It is expected to close in the near future (EPA–HQ–OAR–2008–0218–0069). The mill also uses an impoundment constructed before 1989 as an evaporation pond (known as Cell 1). To the extent this evaporation pond contains byproduct material, its HAP emissions are also regulated by Subpart W.

The Sweetwater conventional mill is located 42 miles northwest of Rawlins, Wyoming. The mill operated for a short time in the 1980s and is currently in standby status. Annual radon values collected by the facility indicate that there is little measurable radon flux from the mill tailings that are currently in the lined impoundment. This monitoring program remains active at the facility. According to company records, of the 37 acres of tailings, approximately 28.3 acres of tailings are covered with soil; the remainder of the tailings are continuously covered with water. The dry tailings have an earthen cover that is maintained as needed. During each monitoring event one hundred radon flux measurements are taken on the tailings continuously covered by soil, as required by Method 115 for compliance with Subpart W. The mean radon flux for the exposed tailings over the past 21 years was 3.5 pCi/m^2/sec. The radon flux for the entire tailings impoundment was calculated to be 6.01 pCi/m^2/sec. The calculated radon flux from the entire tailings impoundment surface is thus approximately 30% of the 20.0 pCi/m^2/sec standard (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon project is a conventional mill located about 3 miles north of Ticaboo, Utah, in Garfield County. The approximately 1,900-acre site includes an ore pad, a small milling building, and a tailings impoundment system that is partially constructed. The mill operated for a very short period of time. Shootaring Canyon did pre-date the standard, but the mill was shut down prior to the promulgation of the standard. The impoundment is in a standby status and has an active license administered by the Utah Department of Environmental Quality, Division of Radiation Control. The future plans for this uranium recovery operation are unknown. Current activities at this remote site consist of intermittent environmental monitoring by consultants to the parent company (EPA–HQ–OAR–2008–0218–0087).

The Shootaring Canyon mill operated for approximately 30 days. Tailings were deposited in a portion of the upper impoundment. A lower impoundment was conceptually designed but has not been built. Milling operations in 1982 produced 25,000 cubic yards of tailings, deposited in a 2,508 m^2 (0.62 acres) area. The tailings are dry except for moisture associated with occasional precipitation events; consequently, there are no beaches.[17] The tailings have a soil cover that is maintained by the operating company. Radon sampling for the 2010 year took place in April. Again, one hundred radon flux measurements were collected. The average radon flux from this sampling event was 11.9 pCi/m^2-sec.

A fourth mill is Cotter Corporation in Cañon City, Colorado. The mill no longer exists, and the pre-1989 impoundments are in closure.

2. 1989–Present Conventional Mill Impoundments

There currently is only one operating conventional mill with an impoundment that was constructed after December 15, 1989. The White Mesa conventional mill in Utah has two impoundments (Cell 4A and Cell 4B: Cell 4A is currently operating as a conventional impoundment and Cell 4B is being used as an evaporation pond) designed and constructed after 1989. The facility uses the phased disposal work practice.

There are several conventional mills in the planning and/or permitting stage and conventional impoundments at these mills will be required to utilize one of the current work practice standards.

3. In-Situ Leach Facilities

After 1989 the price of uranium began to fall, and the uranium mining and milling industry essentially collapsed, with very few operations remaining in business. However, several years ago the price of uranium began to rise so that it became profitable once more for companies to consider uranium recovery. ISL has become the preferred choice for uranium extraction where suitable geologic conditions exist.

Currently there are five ISL facilities in operation: (1) The Alta Mesa project in Brooks County, Texas; (2) the Crow Butte Operation in Dawes County, Nebraska; (3) the Hobson/La Palangana Operation in South Texas; (4) the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and (5) the Smith Ranch-Highland Operation in Converse County, Wyoming.[18] These facilities use or have used evaporation ponds to hold back liquids containing uranium byproduct material from reinjection to maintain a proper hydraulic gradient within the wellfield.[19] These ponds are subject to the Subpart W requirements and range in size from less than an acre to up to 40 acres. Based on the information provided to us the ponds meet the requirements of 40 CFR 61.252(c).

There are approximately 11 additional ISL facilities in various stages of licensing or on standby. It is anticipated that there could be approximately another 20–30 license applications over the next 5–10 years.[20]

4. Heap Leach Facilities

As stated earlier, there are currently no operating heap leach facilities in the United States. We are aware of two or three potential future operations. The project most advanced in the application process is the Sheep Mountain facility in Wyoming. Energy Fuels has announced its intent to submit a license application to the NRC in March 2014. One or two other as yet to be determined operations may be located in Lander County, Nevada and/or a site in New Mexico.[21]

5. Flux Requirement Versus Management Practices for Conventional Impoundments in Operation Before December 15, 1989

In performing our analysis we considered the information we received from all the existing conventional impoundments. We also looked at the compliance history of the existing conventional impoundments. After this review we considered two specific questions: (1) Are any of the conventional impoundments using any novel methods to reduce radon emissions? (2) Is there now any reason to believe that any of the existing conventional impoundments could not comply with the management practices for new conventional impoundments, in which case would we need to continue to make the distinction between conventional impoundments constructed before or after December 15, 1989? We arrived at the following

[17] The term ''beaches'' refers to portions of the tailings impoundment where the tailings are wet but not saturated or covered with liquids.

[18] Source: U.S. Energy Information Administration, *http://www.eia.gov/uranium/production/quarterly/html/qupd_tbl4.html.*

[19] The Alta Mesa operation uses deep well injection rather than evaporation ponds.

[20] Source: *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

[21] *http://www.nrc.gov/materials/uranium-recovery/license-apps/ur-projects-list-public.pdf.*

conclusions: First, we are not aware of any conventional impoundment that uses any new or different technologies to reduce radon emissions. Conventional impoundment operators continue to use the standard method of reducing radon emissions by limiting the size of the impoundment and covering tailings with soil or keeping tailings wet. These are very effective methods for limiting the amount of radon released to the environment.

Second, we believe that only one existing operating conventional impoundment designed and in operation before December 15, 1989, could not meet the work practice standards. This impoundment is Cell 3 at the White Mesa mill, which is expected to close in 2014 (Personal communication between EPA staff and Utah Department of Environmental Quality staff, May 16, 2013, EPA–HQ–2008–0218–0081). We were very clear in our 1989 rulemaking that all conventional mill impoundments must meet the requirements of 40 CFR 192.32(a), which, in addition to requiring ground-water monitoring, also required the use of liner systems to ensure there would be no leakage from the impoundment into the ground water. We did this by removing the exemption for existing piles from the 40 CFR 192.32(a) requirements (54 FR 51680). However, we did not require those existing impoundments to meet either the phased disposal or continuous disposal work practice standards, which limit the exposed area and/or number of conventional impoundments, thereby limiting the potential for radon emissions. This is because at the time of promulgation of the rule, conventional impoundments existed that were larger in area than the maximum work practice standard of 40 acres used for the phased disposal work practice, or 10 acres for the continuous disposal requirement. This area limitation was important in reducing the amount of exposed tailings that were available to emit radon. However, we recognized that by instituting a radon flux standard we would require owners and operators to limit radon emissions from these preexisting impoundments (usually by placing water or soil on exposed portions of the impoundments). The presumption was that conventional impoundments constructed before this date could otherwise be left in a dry and uncovered state, which would allow for unfettered release of radon. The flux standard was promulgated to have the practical effect of requiring owners and operators of these old impoundments to keep their tailings either wet or covered with soil, thereby reducing the amount of radon that could be emitted (54 FR 51680).

We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a). We also have information that the new conventional impoundments operating at the White Mesa mill will utilize the phased work practice standard of limiting conventional impoundments to no more than two, each 40 acres or less in area. We also have information that Cell 3 at the White Mesa facility will be closed in 2014, and the phased disposal work method will be used for the remaining cells. (Personal communication between EPA staff and staff of Utah Department of Environmental Quality, May 16, 2013 (EPA–HQ–2008–0218–0081). As a result, we find there would be no conventional impoundment designed or constructed before December 15, 1989 that could not meet a work practice standard. Since the conventional impoundments in existence prior to December 15, 1989 appear to meet the work practice standards, we are proposing to eliminate the distinction of whether the conventional impoundment was constructed before or after December 15, 1989. We are also proposing that all conventional impoundments (including those in existence prior to December 15, 1989) must meet the requirements of one of the two work practice standards, and that the flux standard of 20 pCi/m^2/sec will no longer be required for the impoundments in existence prior to December 15, 1989.

G. How does this action relate to other EPA standards?

Under the CAA, EPA promulgated Subpart W, which includes standards and other requirements for controlling radon emissions from operating mill tailings at uranium recovery facilities. Under our authority in the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), we have also issued standards that are more broadly applicable to uranium and thorium byproduct materials at active and inactive uranium recovery facilities. NRC (or Agreement States [22]) and DOE implement and enforce these standards at these uranium recovery facilities as directed by UMTRCA. These standards, located in 40 CFR part 192, address the radiological and non-radiological hazards of uranium and thorium byproduct materials in ground water and soil, in addition to air. For the non-radiological hazards, UMTRCA directed us to promulgate standards consistent with those used by EPA to regulate non-radiological hazardous materials under RCRA. Therefore, our part 192 standards incorporate the ground-water protection requirements applied to hazardous waste management units under RCRA and specify the placement of uranium or thorium byproduct materials in impoundments constructed in accordance with RCRA requirements. Radon emissions from non-operational impoundments (i.e., those with final covers) are limited in 40 CFR part 192 to the emissions levels of 20 pCi/m^2/sec. We are currently preparing a regulatory proposal to update provisions of 40 CFR part 192, with emphasis on ground-water protection for ISL facilities. As explained in previous sections, Subpart W currently contains reference to some of the part 192 standards.

H. Why did we conduct an updated risk assessment?

While not required by or conducted as part of our GACT analysis, one of the tasks we performed for our own purposes was to update the risk analysis we performed when we promulgated Subpart W in 1989. We performed a comparison between the 1989 risk assessment and current risk assessment approaches, focusing on the adequacy and the appropriateness of the original assessments. We did this for informational purposes only and not for or as part of our GACT analysis. Instead, we prepared this updated risk assessment because we wanted to demonstrate that even using updated risk analysis procedures (i.e. using procedures updated from those used in the 1980s), the existing radon flux standard appears to be protective of the public health and the environment. We did this by using the information we collected to perform new risk assessments for existing facilities, as well as two idealized ‘‘generic’’ sites, one located in the eastern half of the United States and one located in the southwest United States. (These two model sites do not exist. They are idealized using representative features

[22] An Agreement State is a State that has entered into an agreement with the Nuclear Regulatory Commission under section 274 of the Atomic Energy Act of 1954 (42 U.S.C. 2021)and has authority to regulate byproduct materials (as defined in section 11e.(2)of the Atomic Energy Act)and the disposal of low-level radioactive waste under such agreement.

of mills in differing climate and geography). This information has been collected into one document [23] that has been placed in the docket (EPA–HQ–OAR–2008–0218–0087) for this proposed rulemaking.

As part of this work, we evaluated various computer models that could be used to calculate the doses and risks due to the operation of conventional and ISL uranium recovery facilities, and selected CAP88 V 3.0 for use in this analysis. CAP88 V 3.0 was developed in 1988 from the AIRDOS, RADRISK, and DARTAB computer programs, which had been developed for the EPA at the Oak Ridge National Laboratory (ORNL).

CAP88 V 3.0, which stands for ''Clean Air Act Assessment Package-1988 version 3.0,'' is used to demonstrate compliance with the NESHAP requirements applicable to radionuclides. CAP88 V 3.0 calculates the doses and risk to a designated receptor as well as to the surrounding population. Exposure pathways evaluated by CAP88 V 3.0 are: inhalation, air immersion, ingestion of vegetables, meat, and milk, and ground surface exposure. CAP88 V 3.0 uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from up to six emitting sources. The sources may be either elevated stacks, such as a smokestack, or uniform area sources, such as the surface of a uranium byproduct material impoundment. Plume rise can be calculated assuming either a momentum or buoyant-driven plume.

At several sites analyzed in this evaluation only site-wide releases of radon were available to us. This assessment was limited by the level of detail provided by owners and operators of uranium recovery facilities. In instances where more specific site data were available, site-wide radon releases were used as a bounding estimate. Assessments are done for a circular grid of distances and directions for a radius of up to 80 kilometers (50 miles) around the facility. The Gaussian plume model produces results that agree with experimental data as well as any comparable model, is fairly easy to work with, and is consistent with the random nature of turbulence. A description of CAP88 V 3.0 and the computer models upon which it is based is provided in the CAP88 V 3.0 Users Manual.[24]

The uranium recovery facilities that we analyzed included three existing conventional mills (Cotter, White Mesa and Sweetwater), five operating ISL operations (the Alta Mesa project in Brooks County, Texas; the Crow Butte Operation in Dawes County, Nebraska; the Hobson/La Palangana Operation in South Texas; the Willow Creek (formerly Christensen Ranch/Irigaray Ranch) Operation in Wyoming; and the Smith Ranch-Highland Operation in Converse County, Wyoming), and two generic sites assumed for the location of conventional mills (we chose conventional mills because we believe they have the potential for greater radon emissions). One generic site was modeled in the southwest United States (Western Generic) while the other was assumed to be located in the eastern United States (Eastern Generic).[25] An Eastern generic site was selected for the second generic site to accommodate the recognition that a number of uranium recovery facilities are expected to apply for construction licenses in the future, and to determine potential risks in geographic areas of the U.S. that customarily have not hosted uranium recovery facilities. For this assessment the conventional mills we were most interested in were the White Mesa mill and the Sweetwater mill. (The Shootaring Canyon mill was not analyzed, because the impoundment is very small and is soil covered, and the Cotter facility is now in closure). These conventional mills are either in operation or standby and are subject to the flux standard of 20 pCi/m^2/sec. The risk analyses performed for these two mills showed that the maximum lifetime cancer risks from radon emissions from the White Mesa impoundments were 1.1×10^{-4} while the maximum lifetime cancer risks from radon associated with the impoundments at the Sweetwater mill were 2.4×10^{-5}. As we indicated in our original 1989 risk assessment, in protecting public health, EPA strives to provide the maximum feasible protection by limiting lifetime cancer risk from radon exposure to approximately 1 in 10,000 (i.e., 10^{-4}).[26] The analyses also estimated that the total cancer risk to the populations surrounding all ten modeled uranium sites (i.e., total cancer fatalities) is between 0.0015 and 0.0026 fatal cancers per year, or approximately 1 case every 385 to 667 years for the 4 million persons living within 80 km of the uranium recovery facilities. Similarly, the total cancer incidence for all ten modeled sites is between 0.0021 and 0.0036 cancers per year, or approximately 1 case every 278 to 476 years. The analyses are described in more detail in the background document generated for this proposal.[27] As stated above, we performed this risk assessment for informational purposes only. The risk assessment was not required or considered during our analysis for proposing GACT standards for uranium recovery facilities (e.g., conventional impoundments, non-conventional impoundments or heap leach piles).

III. Summary of the Proposed Requirements

We are proposing to revise Subpart W to include requirements we have identified that are generally available for controlling radon emissions in a cost-effective manner, and are not currently included in Subpart W. Specifically, we are proposing to require that non-conventional impoundments and heap leach piles must maintain minimum liquid levels to control their radon emissions from these affected sources.

Additionally, we are revising Subpart W to propose GACT standards for the affected sources at conventional uranium mills, ISL facilities and heap leach facilities. Given the evolution of uranium recovery facilities over the last 20 years, we believe it is appropriate to revise Subpart W to tailor the requirements of the rule to the different types of facilities in existence at this time. We are therefore proposing to revise Subpart W to add appropriate definitions, standards and other requirements that are applicable to HAP emissions at these uranium recovery facilities.

Our experience with ensuring that uranium recovery facilities are in compliance with Subpart W also leads us to propose three more changes. First, we are proposing to remove certain monitoring requirements that we believe are no longer necessary for demonstrating compliance with the proposed GACT standards. Second, we are proposing to revise certain definitions so that owners and operators clearly understand when Subpart W applies to their facility. Third, we are proposing to clarify what specific liner

[23] Technical and Regulatory Support to Develop a Rulemaking to Potentially Modify the NESHAP Subpart W Standard for Radon Emissions from Operating Uranium Mills (40 CFR 61.250).

[24] *http://www.epa.gov/radiation/assessment/CAP88 V 3.0/index.html.*

[25] There is a potential in the future for uranium recovery in areas like south-central Virginia.

[26] See 54 FR 51656

[27] All risks are presented as LCF risks. If it is desired to estimate the morbidity risk, simply multiply the LCF risk by 1.39. For a more detailed analysis of cancer mortality and morbidity, please see the Background Information Document, Docket number EPA–HQ–OAR–0218–0087.

requirements must be met under Subpart W.[28]

Taken altogether, the proposed revisions to Subpart W are appropriate for updating, clarifying and strengthening the management of radon emissions from the uranium byproduct material generated at uranium recovery facilities.

A. What are the affected sources?

Today we are proposing to revise Subpart W to include requirements for affected sources at three types of operating uranium recovery facilities: (1) Conventional uranium mills; (2) ISL facilities; and (3) heap leach facilities. The affected sources at these uranium recovery facilities include conventional impoundments, non-conventional impoundments where tailings are contained in ponds and covered by liquids (examples of these affected sources are evaporation or holding ponds that may exist at conventional mills, ISL facilities and heap leach facilities), and heap leach piles. The proposed GACT standards and the rationale for these proposed standards are discussed below and in Section IV. We request comment on all aspects of these proposed requirements.

B. What are the proposed requirements?

1. Conventional Impoundments

In the 1989 promulgation of Subpart W we created two work practice standards, phased disposal and continuous disposal, for uranium tailings impoundments designed and constructed after December 15, 1989. The work practice standards, which limit the exposed area and/or number of conventional impoundments at a uranium recovery facility, require that these impoundments be no larger than 40 acres (for phased disposal) or 10 uncovered acres (for continuous disposal). We also limited the number of conventional impoundments operating at any one time to two. We took this approach because we recognized that the radon emissions from very large conventional impoundments could impose unacceptable health effects if the piles were left dry and uncovered. The 1989 promulgation also included the requirements in 40 CFR 192.32(a), which include design and construction requirements for the impoundments as well as requirements for prevention and mitigation of ground-water contamination.

As discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed. We believe that the existing conventional impoundments at both the Shootaring Canyon and Sweetwater facilities can meet the work practice standards in the current Subpart W regulation. The conventional impoundments at both these facilities are less than 40 acres in area and are synthetically lined as per the requirements in 40 CFR 192.32(a)(1). The existing cell 3 at the White Mesa mill will undergo closure in 2014 and will be replaced with the impoundments currently under construction that meet the phased disposal work practice standard. Therefore, there is no reason not to subject these older impoundments to the work practice standards required for impoundments designed or constructed after December 15, 1989. By incorporating these impoundments under the work practices provision of Subpart W, it is no longer necessary to require radon flux monitoring, and we are proposing to eliminate that requirement.

The proposed elimination of the monitoring requirement in 40 CFR 61.253 applies only to those facilities currently subject to the radon flux standard in 40 CFR 61.252(a), which applies to only the three conventional impoundments in existence prior to the original promulgation of Subpart W on December 15, 1989. While we are proposing to eliminate the radon monitoring requirement for these three impoundments under Subpart W, this action does not relieve the owner or operator of the uranium recovery facility of the monitoring and maintenance requirements of their operating license issued by the NRC or its Agreement States. These requirements are found at 10 CFR Part 40, Appendix A, Criterion 8 and 8A. Additionally, NRC, through its Regulatory Guide 4.14, may also recommend incorporation of radionuclide air monitoring at operating facility boundaries.

Further, when the impoundments formally close they are subject to the radon monitoring requirements of 40 CFR 192.32(a)(3), also under the NRC licensing requirements.

From a cost standpoint, by not requiring radon monitoring we expect that for all three sites the total annual average cost savings would be $29,200, with a range from about $21,000 to $37,000. More details on economic costs can be found in Section IV.B of this preamble.

For the proposed rule we also evaluated the requirements of 40 CFR 192.32(a) as they pertain to the Subpart W standards. The requirements of 40 CFR 192.32(a) are included in the NRC's regulations and are reviewed for compliance by NRC during the licensing process for a uranium recovery facility. We determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for design and operation of surface impoundments at 40 CFR 264.221, are the only requirements necessary for EPA to incorporate for Subpart W, as they are effective methods of containing tailings and protecting ground water while also limiting radon emissions. This liner requirement, described earlier in this preamble, remains in use for the permitting of hazardous waste land disposal units under RCRA. The requirements at 40 CFR 192.32(a)(1) contain safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. We are therefore proposing to retain the two work practice standards and the requirements of 40 CFR 192.32(a)(1) as GACT for conventional impoundments because these methods for limiting radon emissions while also protecting ground water have proven effective for these types of impoundments.

2. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for non-conventional impoundments where uranium byproduct materials are contained in ponds and covered by liquids. Common names for these structures may include, but are not limited to, impoundments and evaporation or holding ponds. These affected sources may be found at any of the three types of uranium recovery facilities.

These units meet the existing applicability criteria in 40 CFR 61.250 to classify them for regulation under Subpart W. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct material, either in solid form or dissolved in solution, and therefore their emissions are regulated under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content.

[28] Under its CAA authority, EPA requires facilities subject to Subpart W to build impoundments in a manner that complies with the requirements found in 40 CFR 192. As a matter of convenience, EPA cross-references the part 192 requirements in Subpart W instead of copying them directly into Subpart W. This cross-referencing convention is often used in rulemakings.

Therefore, emissions for the ponds at uranium recovery facilities that contain either uranium byproduct material in solid form or radionuclides dissolved in liquids are regulated under Subpart W. Today we are again stating that determination and proposing a GACT standard specifically for these impoundments.

Evaporation or holding ponds, while sometimes smaller in area than conventional impoundments, perform a basic task. They hold uranium byproduct material until it can be disposed. Our survey of existing ponds shows that they contain liquids, and, as such, this general practice has been sufficient to limit the amount of radon emitted from the ponds, in many cases, to almost zero. Because of the low potential for radon emissions from these impoundments, we do not believe it is necessary to monitor them for radon emissions. We have found that as long as approximately one meter of liquid is maintained in the pond, the effective radon emissions from the pond are so low that it is difficult to determine whether there is any contribution above background radon values. EPA has stated in the *Final Rule for Radon-222 Emissions from Licensed Uranium Mill Tailings: Background Information Document* (August, 1986):

''Recent technical assessments of radon emission rates from tailings indicate that radon emissions from tailings covered with less than one meter of water, or merely saturated with water, are about 2% of emissions from dry tailings. Tailings covered with more than one meter of water are estimated to have a zero emissions rate. The Agency believes this calculated difference between 0% and 2% is negligible. The Agency used an emission rate of zero for all tailings covered with water or saturated with water in estimating radon emissions.''

Therefore, we are proposing as GACT that these impoundments meet the design and construction requirements of 40 CFR 192.32(a)(1), with no size/area restriction, and that during the active life of the pond at least one meter of liquid be maintained in the pond.

We are also proposing that no monitoring be required for this type of impoundment. We have received information and collected data that show there is no acceptable radon flux test method for a pond holding a large amount of liquid. (Method 115 does not work because a solid surface is needed to place the large area activated carbon canisters used in the Method). Further, even if there was an acceptable method, we recognize that radon emissions from the pond would be expected to be very low because the liquid acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for most of the radon produced by the solids or from solution to migrate to the water surface and cross the water/air interface before decaying(EPA–HQ–OAR–2008–0218–0087). It therefore appears that monitoring at these ponds is not necessary for demonstrating compliance with the proposed standards. We do, however, ask for comment and supporting information on three issues: (1) Whether these impoundments need to be monitored with regard to their radon emissions, and why; (2) whether these impoundments need to be monitored to ensure at least one meter of liquid is maintained in the pond at all times, and (3) if these impoundments do need monitoring, what methods could a facility use (for example, what types of radon collection devices, or methods to measure liquid levels) at evaporation or holding ponds.

3. Heap Leach Piles

The final impoundment category for which we are proposing GACT standards is heap leach piles. We are proposing to require that heap leach piles meet the phased disposal work practice standard set out in Section III B. 1. of this preamble (which limits an owner/operator to no more than two operating heap leach piles of no more than 40 acres each at any time) and the design and construction requirements at 40 CFR 192.32(a)(1) as GACT. We are also requiring heap leach piles to maintain minimum moisture content of 30% so that the byproduct material in the heap leach pile does not dry out, which would increase radon emissions from the heap leach pile.

As noted earlier in the preamble, there are currently no operating uranium heap leach facilities in the United States. We are aware that the one currently proposed heap leach facility will use the design and operating requirements at 40 CFR 192.32(a)(1) for the design of its heap. Since this requirement will be used at the only example we have for a heap leach pile, it (design and operating requirements at 40 CFR 192.32(a)(1)), along with the phased disposal work practice standard (limiting the number and size of heap leach piles), will be the standards that we propose as GACT for heap leach piles. The premise is that the operator of a heap would not want to lose any of the uranium-bearing solution; thus, it is cost effective to maintain a good liner system so that there will be no leakage and ground water will be protected. Also, use of the phased disposal work practice standard will limit the amount of exposed uranium byproduct material that would be available to emit radon. If we assume that uranium ore (found in the heap leach pile) and the resultant leftover byproduct material after processing emit radon at the same rate as uranium byproduct material in a conventional impoundment (a conservative estimate), we can also assume that the radon emissions will be nearly the same as two 40 acre conventional impoundments.

We recognize that owners and operators of conventional impoundments also limit the amount of radon emitted by keeping the tailings in the impoundments covered, either with soil or liquids. At the same time, however, we recognize that keeping the uranium byproduct material in the heap in a saturated or near-saturated state (in order to reduce radon emissions) is not a practical solution as it would be at a conventional tailings impoundment. In the definitions at 40 CFR 61.251(c) we have defined ''dewatered'' tailings as those where the water content of the tailings does not exceed 30% by weight. We are proposing today to require operating heaps to maintain moisture content of greater than 30% so that the byproduct material in the heap is not allowed to become dewatered which would allow more radon emissions. We are specifically asking for comment on the amount of liquid that should be required in the heap, and whether the 30% figure is a realistic objective. We are also asking for comments on precisely where in the heap leach pile this requirement must be met. The heap leach pile may not be evenly saturated during the uranium extraction process. The sprayer/drip system commonly used on the top of heap leach piles usually results in a semi-saturated moisture condition at the top of the pile, since flow of the lixiviant is not uniformly spread across the top of the pile. As downward flow continues, the internal areas of the pile become saturated. We are requesting information and comment on where specifically in the pile the 30% moisture content should apply.

C. What are the monitoring requirements?

As the rule currently exists, only mills with existing conventional impoundments in operation on or prior to December 15, 1989, are currently required to monitor to ensure compliance with the radon flux standard. The reason for this is because at the time of promulgation of the 1989 rule, EPA stated that no flux monitoring would be required for new impoundments because the proposed

work practice standards would be effective in reducing radon emissions from operating impoundments by limiting the amount of tailings exposed (54 FR 51681). Since we have now determined that existing older conventional impoundments can meet one of the two work practice standards, we are proposing to eliminate the radon flux monitoring requirement.

In reviewing Subpart W we looked into whether we should extend radon monitoring to all affected sources constructed and operated after 1989 so that the monitoring requirement would apply to all conventional impoundments, non-conventional impoundments and heap leach piles containing uranium byproduct materials. We also reviewed how this requirement would apply to facilities where Method 115 is not applicable, such as at impoundments totally covered by liquids. We concluded that the original work practice standards (now proposed as GACT) continue to be an effective practice for the limiting of radon emissions from conventional impoundments and from heap leach piles. We also concluded that by maintaining an effective water cover on non-conventional impoundments the radon emissions from those impoundments are so low as to be difficult to differentiate from background radon levels at uranium recovery facilities. Therefore, we are proposing today that it is not necessary to require radon monitoring for any affected sources regulated under Subpart W. We seek comment on our conclusion that radon monitoring is not necessary for any of these sources as well as on any available cost-effective options for monitoring radon at non-conventional impoundments totally covered by liquids.

D. What are the notification, recordkeeping and reporting requirements?

New and existing affected sources are required to comply with the existing requirements of the General Provisions (40 CFR part 61, subpart A). The General Provisions include specific requirements for notifications, recordkeeping and reporting, including provisions for notification of construction and/or modification and startup as required by 40 CFR 61.07, 61.08 and 61.09.

Today we are also proposing that all affected sources will be required to maintain certain records pertaining to the design, construction and operation of the impoundments, both including conventional impoundments, and nonconventional impoundments, and heap leach piles. We are proposing that these records be retained at the facility and contain information demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1), including but not limited to, all tests performed that prove the liner is compatible with the material(s) being placed on the liner. For nonconventional impoundments we are proposing that this requirement would also include records showing compliance with the continuous one meter of liquid in the impoundment;[29] for heap leach piles, we are proposing that this requirement would include records showing that the 30% moisture content of the pile is continuously maintained. Documents showing that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) are already required as part of the pre-construction application submitted under 40 CFR 61.07, so these records should already be available. Records showing compliance with the one meter liquid cover requirement for nonconventional impoundments and records showing compliance with the 30% moisture level required in heap leach piles can be created and stored during the daily inspections of the tailings and waste retention systems required by the NRC (and Agreement States) under the inspection requirements of 10 CFR 40, Appendix A, Criterion 8A.

Because we are proposing new record-keeping requirements for uranium recovery facilities, we are required by the Paperwork Reduction Act (PRA) to prepare an estimate of the burden of such record-keeping on the regulated entity, in both cost and hours necessary to comply with the requirements. We have submitted the Information Collection Request (ICR) containing this burden estimate and other supporting documentation to the Office of Management and Budget (OMB). See Section VII.B for more discussion of the PRA and ICR.

We believe the record-keeping requirements proposed today will not create a significant burden for operators of uranium recovery facilities. As described earlier, we are proposing to require retention of three types of records: (1) Records demonstrating that the impoundments and/or heap leach pile meet the requirements in section 192.32(a)(1) (e.g. the design and liner testing information); (2) records showing that one meter of water is maintained to cover the byproduct material stored in nonconventional impoundments; and (3) records showing that heap leach piles maintain a moisture content of at least 30%.

Documents demonstrating that the affected sources comply with section 192.32(a)(1) requirements are necessary for the facility to obtain regulatory approval from NRC (or an NRC Agreement State) and EPA to construct and operate the affected sources (this includes any revisions during the period of operations). Therefore, these records will exist independent of Subpart W requirements and will not need to be continually updated as a result of this record-keeping requirement in Subpart W; however, we are proposing to include this record-keeping requirement in Subpart W to require that the records be maintained at the facility during its operational lifetime (in some cases the records might be stored at a location away from the facility, such as corporate offices). This might necessitate creating copies of the original records and providing a location for storing them at the facility.

Keeping a record to provide confirmation that water to a depth of one meter is maintained above the byproduct material stored in nonconventional impoundments should also be relatively straightforward. This would involve placement of a measuring device or devices in or at the edge of the impoundment to allow observation of the water level relative to the level of byproduct material in the impoundment. Such devices need not be highly technical and might consist of, for example, measuring sticks with easily-observable markings placed at various locations, or marking the sides of the impoundment to illustrate different water depths. As noted earlier, NRC and Agreement State licenses require operators to inspect the facility on a daily basis. Limited effort should be necessary to make observations of water depth and record the information in inspection log books that are already kept on site and available to inspectors.

Similarly, daily inspections would provide a mechanism for recording moisture content of heap leach piles. However, because no heap leach facilities are currently operating, there is more uncertainty about exactly how the operator will determine that the heap has maintained a 30% moisture content. As discussed in more detail in Section IV.E.4 of this preamble, soil moisture probes are readily available and could be used for this purpose. Such probes could be either left in the heap leach pile, placed at locations that provide a

[29] The one meter liquid requirement pertains to having one meter of liquid cover any and all solid byproduct material. We do not anticipate a large quantity of solid byproduct material in these nonconventional impoundments (EPA–HQ–OAR–2008–0218–0088).

representative estimate for the heap as a whole, or facility personnel could use handheld probes to collect readings. The facility might also employ mass-balance estimates to provide a further check on the data collected.

We estimate the burden in hours and cost for uranium recovery facilities to comply with the proposed recordkeeping requirements are as follows:

TABLE 1—BURDEN HOURS AND COSTS FOR PROPOSED RECORDKEEPING REQUIREMENTS

[Annual figures except where noted]

Activity	Hours	Costs
Maintaining Records for the section 192.32(a)(1) requirements	*20	*$1,360
Verifying the one meter liquid requirement for nonconventional impoundments	288	12,958
Verifying the 30% moisture content at heap leach piles using multiple soil probes	2,068	86,548

* These figures represent a one-time cost to the facility.

Burden levels for heap leach piles are most uncertain because they depend on the chosen method of measurement (e.g., purchasing and maintaining multiple probes or a smaller number of handheld units) as well as the personnel training involved (e.g., a person using a handheld unit will likely need more training than someone who is simply recording readings from already-placed probes). We request comment on our estimates of burden, as well as suggestions of methods that could readily and efficiently be used to collect the required information. More discussion of the ICR and opportunities for comment may be found in Section VII.B.

E. When must I comply with these proposed standards?

All existing affected sources subject to this proposed rule would be required to comply with the rule requirements upon the date of publication of the final rule in the **Federal Register**. To our knowledge, there is no existing operating uranium recovery facility that would be required to modify its affected sources to meet the requirements of the final rule; however, we request any information regarding affected sources that would not meet these requirements. New sources would be required to comply with these rule requirements upon the date of publication of the final rule in the **Federal Register** or upon startup of the facility, whichever is later.

IV. Rationale for This Proposed Rule

A. How did we determine GACT?

As provided in CAA section 112(d)(5), we are proposing standards representing GACT for this area source category. In developing the proposed GACT standards, we evaluated the control technologies and management practices that are available to reduce HAP emissions from the affected sources and identified those that are generally available and utilized by operating uranium recovery facilities.

As noted in Section II.F., for this proposal we solicited information on the available controls and management practices for this area source category using written facility surveys (surveys authorized by section 114(a) of the CAA), reviews of published literature, and reviews of existing facilities (EPA–HQ–OAR–0218–0066). We also held discussions with trade association and industry representatives and other stakeholders at various public meetings.[30] Our determination of GACT is based on this information. We also considered costs and economic impacts in determining GACT (See Section VI.).

We identified two general management practices that reduce radon emissions from affected sources. These general management practices are currently being used at all existing uranium recovery facilities. First, limiting the area of exposed tailings in conventional impoundments limits the amount of radon that can be emitted. The work practice standards currently included in Subpart W require owners and operators of affected sources to implement this management practice by either limiting the number and area of existing, operating impoundments or covering dewatered tailings to allow for no more than 10 acres of exposed tailings. This is an existing requirement of Subpart W and of the NRC licensing requirements; hence, owners and operators of uranium recovery facilities are already incurring the costs associated with limiting the area of conventional impoundments (and as proposed, heap leach piles) to 40 acres or less (as well as no more than two conventional impoundments in operation at any one time), or limiting the area of exposed tailings to no more than 10 acres.

Second, covering uranium byproduct materials with liquids is a general management practice that is an effective method for limiting radon emissions. This general management practice is often used at nonconventional impoundments, which, as stated earlier, are also known as evaporation or holding ponds. These nonconventional impoundments also contain byproduct material, and thus their HAP emissions are regulated under Subpart W. They are also regulated under the NRC operating license. While they hold mostly liquids, they are still designed and constructed in the manner of conventional impoundments, meaning they meet the requirements of section 192.32(a)(1). While this management practice of covering uranium byproduct materials in impoundments with liquids is not currently required under Subpart W, facilities using this practice have generally shown its effectiveness in reducing emissions in both conventional impoundments (that make use of phased disposal) and nonconventional impoundments (i.e. holding or evaporation ponds). We are therefore proposing to require the use of liquids in nonconventional impoundments as a way to limit radon emissions.

Therefore, after review of the available information and from the evidence we have examined, we have determined that a combination of the management practices listed above will be effective in limiting radon emissions from this source category, and will do so in a cost effective manner. We also believe that since heap leach piles are in many ways similar to the design of conventional impoundments, the same combination of work practices (limitation to no more than two operating heap leach piles, each one no more than 40 acres) will limit radon emissions in heap leach piles. We discuss our reasons supporting these conclusions in more detail in Section IV.B.

[30] See *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html* for a list of presentations made at public meetings held by EPA and at various conferences open to the public.

B. Proposed GACT Standards for Operating Mill Tailings

1. Requirements at 40 CFR 192.32(a)(1)

As an initial matter, we determined that the requirements at 40 CFR 192.32(a)(1), which reference the RCRA requirements for the design and construction of liners at 40 CFR 264.221, continue to be an effective method of containment of tailings for all types of affected sources (EPA–HQ–OAR–2008–0218–0015). The liner requirements, described earlier in this document, remain in use for the permitting of hazardous waste land disposal units under RCRA. Because of the requirement for nearly impermeable boundaries between the tailings and the subsurface, and the requirement for leak detection between the liners, we have determined that the requirements contain enough safeguards to allow for the placement of tailings and also provide an early warning system in the event of a leak in the liner system (EPA–HQ–OAR–2008–0218–0015). For this reason we are proposing to require as GACT that conventional impoundments, non-conventional impoundments and heap leach piles all comply with the liner requirements in 40 CFR 192.32(a)(1). Previously, Subpart W contained this requirement but included a more general reference to 40 CFR 192.32(a); we are proposing to replace that general reference with a more specific reference to 40 CFR 192.32(a)(1) to narrow the requirements under this proposed rule to only the design and construction requirements for the liner of the impoundment contained in 40 CFR 192.32(a)(1).

The estimated average cost of the liner requirement for each type of impoundment at uranium recovery facilities is listed in the table below (EPA–HQ–OAR–2008–0218–0087):

TABLE 2—ESTIMATED LINER COSTS

Table 2—Proposed GACT standards costs per pound of U_3O_8

	Unit cost ($/lb U_3O_8)		
	Conventional	ISL	Heap Leach
GACT—Double Liners for Nonconventional Impoundments	$1.04	$3.07	$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24

Table 2 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 2 presents the total unit cost to implement all relevant GACTs at each type of facility.

Based on the Table 2, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional mills, ISL, and heap leach type uranium recovery facilities, respectively.

In making these cost estimates, we have assumed the following: (1) A conventional impoundment is no larger than 40 acres in size, which is the maximum size allowed for the phased disposal option; (2) a nonconventional impoundment is no larger than 80 acres in size (the largest size we have seen); and (3) a heap leach pile is no larger than 40 acres in size (again, the maximum size allowed under the phased disposal work practice standard, although as with conventional impoundments the owner or operator is limited to two of these affected sources to be in operation at any time).

We do not have precise data for the costs associated with the liner requirements at conventional impoundments using the continuous disposal work practice standard because currently none exist, but a reasonable maximum approximation would be the costs for the 80 acre nonconventional impoundment, since it is the largest we have seen. We believe that no additional costs would be incurred for building a conventional impoundment that will use the continuous disposal option above what we estimated for building a nonconventional impoundment but we ask for comment on whether this assumption is reasonable. We also ask for data on the costs of building a conventional impoundment using continuous disposal, and how those costs would differ from the estimates provided above, or whether the costs we have listed for building a conventional impoundment using phased disposal are a reasonable approximation of the costs for building a conventional impoundment using continuous disposal.

These liner systems are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC and NRC Agreement States through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC or NRC Agreement State license.

The liner systems we are proposing that heap leach piles must use are the same as those used for conventional and nonconventional impoundments. We estimate that the average costs associated with the construction of a 40 acre liner that complies with 40 CFR 192.32(a)(1)is approximately $15.3 million. When compared to the baseline capital costs associated with the facility (estimated at $356 million)(EPA–HQ–OAR–2008–0218–0087), the costs for constructing this type of liner system per facility is about 4% of the total baseline capital costs of a heap leach pile facility (EPA–HQ–OAR–2008–0218–0087).[31]

[31] For our purposes, baseline conditions are defined as a reference point that reflects the world without the proposed regulation. It is the starting point for conducting an economic analysis of the potential benefits and costs of a proposed regulation. The defined baseline influences first the level of emissions expected without regulatory intervention. It thereby also influences the projected level of emissions reduction that may be achieved as a consequence of the proposed regulation. Baselines have no standard definition besides the fact that they simply provide a reference scenario against which changes in economic and environmental conditions (in this case radon emissions) can be measured. In some instances, baselines have been established based on the assumption that economic, environmental and/or other conditions will continue on the present path or trend, purely as time dependant extensions of presently observed patterns. In other instances, baselines are derived from elaborate modeling

Continued

2. Conventional Impoundments

In the 1989 promulgation of Subpart W we required new conventional impoundments to comply with one of two work practice standards, phased disposal or continuous disposal. These work practice standards contain specific limits on the exposed area and/or number of operating conventional impoundments to limit radon emissions because we recognized that radon emissions from very large impoundments could impose unacceptable health effects if the piles were left dry and uncovered. We are proposing as the GACT standard that *all* conventional impoundments—both existing impoundments and new impoundments—comply with one of the two work practice standards, phased disposal or continuous disposal, because these methods for limiting radon emissions by limiting the area of exposed tailings continue to be effective methods for reducing radon emissions from these impoundments (reference EPA 520–1–86–009, August 1986). We are proposing that existing impoundments also comply with one of the two work practice standards because, as discussed earlier, we no longer believe that a distinction needs to be made for conventional impoundments based on the date when they were designed and/or constructed.

We are also not aware of any conventional impoundments either in existence or planned that use any other technologies or management practices to reduce radon emissions. Operators continue to use the general management practices discussed above for reducing radon emissions from their conventional impoundments, i.e., limiting the size and/or number of the impoundments, and covering the tailings with soil or keeping the tailings wet. These management practices form the basis of the work practice standards for conventional impoundments and continue to be very effective methods for limiting the amount of radon released to the environment.

These work practice standards are a cost-effective method for reducing radon emissions from conventional impoundments. In addition, the liner requirements for conventional impoundments are also required by the NRC in their licensing requirements at 10 CFR part 40. Therefore, we are proposing that GACT for conventional impoundments will be the same work practice standards as were previously included in Subpart W.

3. Non-Conventional Impoundments Where Tailings Are Contained in Ponds and Covered by Liquids

Today we are proposing a GACT standard specifically for use by any operating uranium recovery facility that has one or more non-conventional impoundments at its facility (i.e., those impoundments where tailings are contained in ponds and covered by liquids). Common names for these structures may include, but are not limited to, impoundments, evaporation ponds and holding ponds. These ponds contain uranium byproduct material and the HAP emissions are regulated by Subpart W.

Industry has argued in preambles to responses to the CAA section 114(a) letters [32] and elsewhere that Subpart W does not, and was never meant to, include these types of evaporation or holding ponds under the Subpart W requirements. Industry has asserted that the original Subpart W did not specifically reference evaporation or holding ponds but was regulating only conventional mill tailings impoundments. They argue that the ponds are temporary because they hold very little solid material but instead hold mostly liquids containing dissolved radionuclides (which emit very little radon), and at the end of the facility's life they are drained, and any solid materials, along with the liner system, are disposed in a properly licensed conventional impoundment.

EPA has consistently maintained that these non-conventional impoundments meet the existing applicability criteria for regulation under Subpart W. As defined at 40 CFR 61.251(g), uranium byproduct material or tailings means the waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content. The holding or evaporation ponds located at conventional mills, ISL facilities and potentially heap leach facilities contain uranium byproduct materials, either in solid form or dissolved in solution, and therefore their HAP emissions are regulated under Subpart W. Today we reiterate that position and are proposing a GACT standard more specifically tailored for these types of impoundments.

We are proposing that these non-conventional impoundments (the evaporation or holding ponds) must maintain a liquid level in the impoundment of no less than one meter at all times during the operation of the impoundment. Maintaining this liquid level will ensure that radon-222 emissions from the uranium byproduct material in the pond are minimized. We are also proposing that there is no maximum area requirement for the size of these ponds since the chance of radon emissions is small. Our basis for this determination is that radon emissions from the pond will be expected to be very low since the liquid in the ponds acts as an effective barrier to radon emissions; given that radon-222 has a very short half-life (3.8 days), there simply is not enough time for approximately 98% of the radon produced by the solids or from the solution to migrate to the water surface and cross the water/air interface before decaying.

By requiring a minimum of one meter of water in all nonconventional impoundments that contain uranium byproduct material, the release of radon from these impoundments would be greatly reduced. Nielson and Rogers (1986) present the following equation for calculating the radon attenuation:

$$A = e^{\left(-\left[\frac{\lambda}{D}\right]^{0.5} d\right)}$$

Where:

A = Radon attenuation factor (unit less)
λ = Radon-222 decay constant (sec^{-1})
= 2.1×10^{-6} sec^{-1}
D = Radon diffusion coefficient (cm^2/sec)
= 0.003 cm^2/sec in water
d = Depth of water (cm)
= 100 cm

The above equation indicates that the attenuation of radon emanation by water (i.e., the amount by which a water cover will decrease the amount of radon emitted from the impoundment) depends on how quickly radon-222 decays, how quickly radon-222 can move through water (the diffusion coefficient), and the thickness of the layer of water.[33] Solving the above equation shows that one meter of water has a radon attenuation factor of about 0.07. That is, emissions can be expected to be reduced by about 93% compared to no water cover.

The benefit incurred by this requirement is that significantly less radon will be released to the atmosphere. The amount varies from facility to facility based on the size of the nonconventional impoundment, but

projections. Because in all cases their purpose is to project a view of the world without the proposed regulatory intervention, baselines are sometimes termed ''do nothing'' or ''business as usual'' scenarios.

[32] *http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html.*

[33] For a detailed discussion of this topic, which includes the effects of pond water mixing, wind and convection, please see ''Risk Assessment Revision for 40 CFR Part 61 Subpart W-Radon Emissions from Operating Mill Tailings, Task 5 Radon Emission from Evaporation Ponds,''(EPA–HQ–OAR–2008–0218–0080).

across existing facilities radon can be expected to be reduced by approximately 24,600 curies, a decline of approximately 93%.

The estimated cost associated with complying with the proposed one meter of liquid that would be required to limit the amount of radon emissions to the air vary according to the size of the impoundment and the geographic area in which it is located. We estimate that this requirement will cost owners or operators of 80 acre nonconventional impoundments between $1,042 and $9,687 per year. This value varies according to the location of the impoundment, which will determine evaporation rates, which determines how much replacement water will be required to maintain the minimum amount of one meter. If the evaporated water is not replaced by naturally occurring precipitation, then it would need to be replaced with make-up water supplied by the nonconventional impoundment's operator.

The most obvious source of water is what is known as ''process water'' from the extraction of uranium from the subsurface. Indeed, management of this process water is one of the primary reasons for constructing the impoundment in the first place, as the process water contains uranium byproduct material that must also be managed by the facility. It is possible that an operator could maintain one meter of water in the impoundment solely through the use of process water. If so, this would not create any additional costs for the facility as the cost of the process water can be attributed to its use in the uranium extraction process. However, for purposes of estimating the economic impacts associated with our proposal, our cost estimate does not include process water as a source of water potentially added to the impoundment to replace water that has evaporated. Instead, we estimated the costs of using water from other sources. This method results in the most conservative cost estimate for compliance with the one meter requirement.

In performing the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water (EPA–HQ–OAR–2008–0218–0087). Depending on the source of water chosen, we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042.00 and $9,687.00 per year.[34]

This value also varies according to the size and location of the nonconventional impoundment. Such impoundments currently range up to 80 acres in size. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced. The annual cost of makeup water was divided by the base case facility yellowcake annual production rate to calculate the makeup water cost per pound of yellowcake produced (EPA–HQ–OAR–2008–0218–0087). We conclude that this proposed requirement is a cost-effective way to significantly reduce radon emissions from nonconventional impoundments, and is therefore appropriate to propose as a GACT standard for nonconventional impoundments.

4. Heap Leach Piles

The final affected source type for which we are proposing GACT standards is heap leach piles. While there are currently no operating uranium heap leach facilities in the United States, we are proposing to regulate the HAP emission at any future facilities using this type of uranium extraction under Subpart W since the moment that uranium extraction takes place in the heap, uranium byproduct materials are left behind. During the process of uranium extraction on a heap, as the acid drips through the ore, uranium is solubilized and carried away to the collection system where it is further processed. At the point of uranium movement out of the heap, what remains is uranium byproduct materials as defined by 40 CFR 61.251(g). In other words, what remains in the heap is the waste produced by the extraction or concentration of uranium from ore processed primarily for its source material content. Thus, Subpart W applies because uranium byproduct materials are being generated during and following the processing of the uranium ore in the heap.

As a result, we are proposing GACT standards for heap leach piles. We are proposing that these piles conform to the phased disposal work practice standard specified for conventional impoundments in 40 CFR 61.252(a)(1)(i)(which limits the number of active heap leach piles to two, and limits the size of each one to no more than 40 acres) and that the moisture content of the uranium byproduct material in the heap leach pile be greater than or equal to 30% moisture content. We believe that the phased disposal approach can be usefully applied here because it limits the amount of tailings that can be exposed at any one time, which limits the amount of radon that can be emitted. The phased disposal work practice standard is applicable for heap leach piles because heap leach piles are expected to be managed in a manner that is similar in many respects to conventional impoundments. Based on what we understand about the operation of potential future heap leach facilities, after the uranium has been removed from the heap leach pile, the uranium byproduct material that remains would be contained in the heap leach structure which would be lined according to the requirements of 40 CFR 192.32(a)(1). The heap leach pile would also be covered with soil at the end of its operational life to minimize radon emissions.

This is what is required to occur at conventional impoundments using the phased disposal standard. Limiting the size of the operating heap leach pile to 40 acres or less (and the number of operating heap leach piles at any one time to two) has the same effect as it does on conventional impoundments; that is, it limits the area of exposed uranium byproduct material and therefore limits the radon emissions from the heap leach pile. While we believe that the 40 acre limitation is appropriate for heap leach piles, we are requesting comment on what should be the maximum size (area) of a heap leach pile.

We are also proposing as GACT that the heap leach pile constantly maintain a moisture content of at least 30% by weight. By requiring a moisture content of at least 30%, the byproduct material in the heap leach pile will not become dewatered, and we think that the heap leach pile will be sufficiently saturated with liquid to reduce the amount of radon that can escape from the heap leach pile. However, we request further information on all the chemical mechanisms in place during the leaching operation, and whether the 30% moisture content is sufficient for minimizing radon emissions from the heap leach pile. We also request comment on the amount of time the 30% moisture requirement should be maintained by a facility. We are proposing the term ''operational life'' of the facility. We are aware of several operations that take place during the

[34] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. Various references were used for the comparisons. For more detail, please see Section 6.3.3 of the Background Information Document.

uranium extraction process at a heap leach pile. After an initial period of several months of allowing lixiviant to leach uranium from the pile, the heap leach pile is allowed to ''rest,'' which enables the geochemistry in the pile to equilibrate. At that point the heap leach pile may be subjected to another round of extraction by lixiviant, or it may be rinsed to flush out any remaining uranium that is in solution in the heap leach pile. After the rinsing, the pile is allowed to drain and a radon barrier required by 40 CFR 192.32 can be emplaced. We are proposing that the operational life of the heap leach pile be from the time that lixiviant is first placed on the heap leach pile until the time of the final rinse. We believe this incorporates a majority of the time when the heap leach pile is uncovered (no radon barrier has been constructed over the top of the heap) and when the ability for radon to be emitted is the greatest.

Because there is no ''process water'' component to a heap leach operation, as there is for an ISL, water for the heap leach pile must be supplied from an outside source. Even if an ISL and heap leach operation were to be located at the same site, we consider it unlikely that an operator would use ISL process water as the basis for an acidic heap leach solution. It is possible, in fact likely, that the solution used in the heap will be recycled (i.e., applied to the heap more than once), which could reduce the amount of outside water needed to some degree, although as we discuss later in this section, it would not seem that recycling solution would affect the overall moisture content. In calculating the high-end costs of heap leaching, we have not included this possibility in our estimates of economic impacts.

The unit costs for providing liquids to a heap leach pile are assumed to be the same as the unit costs developed for providing water to nonconventional impoundments. In estimating the cost impacts for this requirement, three potential sources of impoundment make-up water were considered: (1) Municipal water suppliers; (2) offsite non-drinking-water suppliers; and (3) on-site water. The only cost associated with maintaining the moisture level within the pile is the cost of the liquid. We assume that existing piping used to supply lixiviant to the pile during leaching would be used to supply water necessary for maintaining the moisture level. Also, we assume that the facility will use the in-soil method for moisture monitoring. The in-soil method and its costs are described below.

Soil moisture sensors have been used for laboratory and outdoor testing purposes and for agricultural applications for over 50 years. They are mostly used to measure moisture in gardens and lawns to determine when it is appropriate to turn on irrigation systems. Soil moisture sensors can either be placed in the soil or held by hand.

For example, one system would bury soil moisture sensors to the desired depth in the heap. Then, a portable soil moisture meter would be connected by cable to each buried sensor one at a time, i.e., a single meter can read any number of sensors. The portable soil moisture meter costs about $350, and each in-soil sensor about $35 or $45, depending on the length of the cable (either 5 or 10 ft). Finally, it is assumed that moisture readings would be performed during the NRC required daily inspections of the heap leach pile, which would require approximately 2,000 additional work hours per year per facility. Our estimates for costs of monitoring the heap include 100 sensors located within the heap, with a meter on each sensor. We chose 100 sampling stations because heaps are generally the same size as conventional impoundments, and Method 115 prescribed 100 measurements for the tailings area of a conventional impoundment. The total estimated costs for using this system, including labor, are approximately $86,500 per year per facility.

Alternatively, with a handheld soil moisture meter, two rods (up to 8 inches long) that are attached to the meter are driven into the soil at the desired location, and a reading is taken. A handheld meter of this type costs about $1,065, and replacement rods about $58 for a pair. A minimum of 100 sampling stations for measuring radon could be required. We did not estimate costs for this method, as we concluded that the length of time required walking around a heap leach pile and obtaining these measurements required more time than is found in an average work day, and would expose workers to potentially hazardous constituents contained in the lixiviant.

The base case heap leach facility includes a heap leach pile that will occupy up to 80 acres at a height of up to 50 feet. With an assumed porosity of 0.39 and a moisture content of 30% by weight, the effective surface area of the liquid within the heap pile is 33.7 acres.

Table 3 presents the calculated cost for make-up water to maintain the moisture level in the heap leach pile, such that the moisture content is at 30% by weight, or greater. The unit costs for water and the net evaporation rates used for these estimates are identical to those derived for evaporation ponds.

TABLE 3—HEAP LEACH PILE ANNUAL MAKEUP WATER COST

Cost type	Water cost ($/gal)	Net evaporation (in/yr)	Makeup water cost ($/yr)	Makeup water rate (gpm/ft²)
Mean	$0.00010	45.7	$4,331	2.3E–05
Median	0.00010	41.3	3,946	2.1E–05
Minimum	0.000035	6.1	196	3.0E–06
Maximum	0.00015	96.5	13,318	4.8E–05

To place this amount of make-up water in perspective, during leaching and rinsing of the heap leach pile, liquid is dripped onto the pile at a rate of 0.005 gallons per minute per square foot (gpm/ft^2). This rate is significantly higher than the make-up water rates necessary to maintain the moisture content at 30% by weight, shown in Table 3. We conclude from this analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances (such as during the final rinse and draindown of the heap leach pile) would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year.

We are asking for comment on exactly where in the pile the 30% moisture content should be achieved. We are also soliciting comments on whether the leaching operation itself liberates more radon into the air than the equivalent of a conventional impoundment. We assume that because low-grade ore is usually processed by heap leach, there would be less radon emitted from a heap leach pile than from a conventional impoundment of similar size. We request information on whether this is a correct assumption.

We are also aware that there could be a competing argument against regulating the heap leach pile under Subpart W while the lixiviant is being placed on the heap leach pile. While not directly correlative, the process of heap leach could be defined as active ''milling.'' The procedure being carried out on the heap is the extraction of uranium. In this view, the operation is focused on the production of uranium rather than on managing uranium byproduct materials. Therefore, under this view, the heap meets the definition of tailings under 40 CFR 61.251(g) only after the final rinse of the heap solutions occurs and the heap is preparing to close. In this scenario the heap leach pile would close under the requirements at 40 CFR part 192.32 and Subpart W would never apply. We are requesting comments on the relative merits of this interpretation.

It bears noting that, as with ISL facilities, collection and/or evaporation ponds (nonconventional impoundments) may exist at heap leach facilities that will also contain uranium byproduct materials. These ponds' HAP emissions will be regulated under Subpart W regardless of whether the heap leach pile is also subject to regulation under that subpart.

V. Other Issues Generated by Our Review of Subpart W

During our review of Subpart W we also identified several issues that need clarification in order to be more fully understood. The issues that we have identified are:

• Clarification of the term ''standby'' and how it relates to the operational phase of an impoundment;

• Amending the definition of ''operation'' of an impoundment so that it is clear when the owner or operator is subject to the requirements of Subpart W;

• Determining whether Subpart W adequately addresses protection from extreme weather events;

• Revising 40 CFR 61.252(b) and (c) to accurately reflect that it is only 40 CFR 192.32(a)(1)that is applicable to Subpart W; and

• Removing the phrase ''as determined by the Nuclear Regulatory Commission'' in 40 CFR 61.252(b)(1) and (2).

A. Clarification of the Term ''Standby''

There has been some confusion over whether the requirements of Subpart W apply to an impoundment that is in ''standby'' mode. This is the period of time that an impoundment may not be accepting tailings, but has not yet entered the ''closure period'' as defined by 40 CFR 192.31(h). This period of time usually takes place when the price of uranium is such that it may not be cost effective for the uranium recovery facility to continue operations, and yet the facility has not surrendered its operating license, and may re-establish operations once the price of uranium rises to a point where it is cost effective to do so. Since the impoundment has not entered the closure period, it could continue to accept tailings at any time; therefore, Subpart W requirements continue to apply to the impoundment. Today we are proposing to add a definition to 40 CFR 61.251 to define ''standby'' as:

Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

B. Amending the Definition of ''Operation'' for a Conventional Impoundment

As currently written, 40 CFR 61.251(e) defines the operational period of a tailings impoundment. It states that ''operation'' means that an impoundment is being used for the continuing placement of new tailings or is in standby status for such placement (which means that as long as the facility has generated byproduct material at some point and placed it in an impoundment, it is subject to the requirements of Subpart W). An impoundment is in operation from the day that tailings are first placed in the impoundment until the day that final closure begins.

There has been some confusion over this definition. For example, a uranium mill announced that it was closing a pre-December 15, 1989, impoundment. Before initiating closure, however, it stated that it would keep the impoundment open to dispose of material generated by other closure activities at the site that contained byproduct material (liners, deconstruction material, etc) but not ''new tailings.'' The company argued that since it was not disposing of new tailings the impoundment was no longer subject to Subpart W. We disagree with this interpretation. While it may be true that the company was no longer disposing of new tailings in the impoundment, it has not begun closure activities; therefore, the impoundment is still open to disposal of byproduct material that emits radon and continues to be subject to all applicable Subpart W requirements.

To prevent future confusion, we are proposing today to amend the definition of ''operation'' in the Subpart W definitions at 40 CFR 61.251 as follows:

Operation means that an impoundment is being used for the continued placement of uranium byproduct material or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

C. Weather Events

In the past, uranium recovery facilities have been located in the western regions of the United States. In these areas, the annual precipitation falling on the impoundment, and any drainage area contributing surface runoff to the impoundment, has usually been less than the annual evaporation from the impoundment. Also, these facilities have been located away from regions of the country where extreme rainfall events (e.g., hurricanes or flooding) could jeopardize the structural integrity of the impoundment, although there is a potential for these facilities to be affected by flash floods, tornadoes, etc. Now, however, uranium exploration and recovery in the U.S. has the potential to move eastward, into more climatologically temperate regions of the country, with south central Virginia being considered for a conventional uranium mill. In determining whether additional measures would be needed for impoundments operating in areas where precipitation exceeds evaporation, a review of the existing requirements was necessary.

The proposed revisions to Subpart W will continue to require owners and operators of all impoundments to follow the requirements of 40 CFR 192.32(a)(1). That particular regulation references the RCRA surface impoundment design and operations requirements of 40 CFR 264.221. At 40 CFR 264.221(g) and (h) are requirements that ensure proper design and operation of tailings impoundments. Section 264.221(g) states that impoundments must be designed, constructed, maintained and operated to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and rain action (e.g., a two foot freeboard requirement); rainfall; run-on;

malfunctions of level controllers, alarms and other equipment; and human error. Section 264.221(h) states that impoundments must have dikes that are designed, constructed and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the unit.

Since impoundments at uranium recovery facilities have been and will continue to be required to comply with the requirements of 40 CFR 192.32(a)(1), they are already required to be designed to prevent failure during extreme weather events. As we stated in Section IV B.2., we believe the requirements of 40 CFR 192.32(a)(1) contain enough safeguards to allow for the placement of tailings and yet provide an early warning system in the event of a leak in the liner system. Therefore, we are proposing to include these requirements in the Subpart W requirements without modification.

D. Applicability of 40 CFR 192.32(a) to Subpart W

The requirements at 40 CFR 61.252(b) and (c) require compliance with 40 CFR 192.32(a). However, we are now proposing to focus the Subpart W requirements on the impoundment design and construction requirements found specifically at 40 CFR 192.32(a)(1). The remainder of 40 CFR 192.32(a) goes beyond this limited scope by including requirements for groundwater detection monitoring systems and closure of operating impoundments. These other requirements, along with all of the part 192 standards, are implemented and enforced by the NRC through its licensing requirements for uranium recovery facilities at 10 CFR part 40, Appendix A. However, when referenced in Subpart W, the requirements in 40 CFR 192.32(a)(1) would also be implemented and enforced by EPA as the regulatory authority administering Subpart W under its CAA authority. Therefore today we are proposing to revise 40 CFR 61.252 (b) and (c) to specifically define which portions of 40 CFR 192.32(a) are applicable to Subpart W. At the same time we are proposing to eliminate the phrase ''. . .as determined by the Nuclear Regulatory Commission'' from 40 CFR 61.252(b). This should eliminate confusion regarding what an applicant must submit to EPA under the CAA in its pre-construction and modification approval applications as required by 40 CFR 61.07, and better explain that EPA is the regulatory agency administering Subpart W under the CAA. This proposed change will have no effect on the licensing requirements of the NRC or its regulatory authority under UMTRCA to implement the part 192 standards through its licenses.

VI. Summary of Environmental, Cost and Economic Impacts

As discussed earlier, uranium recovery activities are carried out at several different types of facilities. We are proposing to revise Subpart W based on how uranium recovery facilities manage uranium byproduct materials during and after the processing of uranium ore at their particular facility. As discussed in Sections III and IV, we are proposing GACT requirements for three types of affected sources at uranium recovery facilities: (1) Conventional impoundments; (2) nonconventional impoundments; and (3) heap leach piles.

For purposes of analyzing the impacts of the proposed rule, we assumed that approximately five conventional milling facilities, 50 ISL facilities (although this is only a projection since only 12 currently exist) and one heap leach facility, each with at least one regulated impoundment, would become subject to the proposed rule. The following sections present our estimates of the proposed rule's air quality, cost and economic impacts. For more information, please refer to the Economic Impact Analysis report that is included in the public docket for this proposed rule (EPA–HQ–OAR–2008–0218–0087).

A. What are the air quality impacts?

We project that the proposed requirements will maintain or improve air quality surrounding the regulated facilities. The GACT standards being proposed today are based on control technologies and management practices that have been used at uranium recovery facilities for the past twenty or more years. These standards will minimize the amount of radon that is released to the air by keeping the impoundments wet or covered with soil and/or by limiting the area of exposed tailings. The requirements in this proposed rule should eliminate or reduce radon emissions at all three types of affected sources.

B. What are the cost and economic impacts?

Table 24 presents a summary of the unit cost (per pound of U_3O_8) for implementing each GACT at each of the three types of uranium recovery facilities. In addition to presenting the GACT costs individually, Table 24 presents the total unit cost to implement all relevant GACTs at each type of facility.

A reference facility for each type of uranium recovery facility is developed and described in Section 6.2, including the base cost estimate to construct and operate (without the GACTs) each of the three types of reference facilities. For comparison purposes, the unit cost (per pound of U_3O_8) of the three uranium recovery reference facilities is presented at the bottom of Table 4.

TABLE 4—PROPOSED GACT STANDARDS COSTS PER POUND OF U_3O_8

	Unit cost (\$/lb U_3O_8)		
	Conventional	ISL	Heap leach
GACT—Double Liners for Nonconventional Impoundments	\$1.04	\$3.07	\$0.22
GACT—Maintaining 1 Meter of Water in Nonconventional Impoundments	0.013	0.010	0.0010
GACT—Liners for Heap Leach Piles	....	....	2.01
GACT—Maintaining Heap Leach Piles at 30% Moisture	....	....	0.0043
GACTs—Total for All Four	1.05	3.08	2.24
Baseline Facility Costs (Section 6.2)	51.56	52.49	46.08

Based on the information in Table 24, implementing all four GACTs would result in unit cost (per pound of U_3O_8) increases of about 2%, 6%, and 5% at conventional, ISL, and heap leach type uranium recovery facilities, respectively.

The baseline costs were estimated using recently published cost data for actual uranium recovery facilities. For the model conventional mill, we used

data from the recently licensed new mill at the Piñon Ridge project in Colorado. For the model ISL facility, we used data from two proposed new facilities: (1) The Centennial Uranium project in Colorado; and (2) the Dewey-Burdock project in South Dakota. The Centennial project is expected to have a 14- to 15-year production period, which is a long duration for an ISL facility, while the Dewey-Burdock project is expected to have a shorter production period of about 9 years, which is more representative of ISL facilities. For the heap leach facility, we used data from the proposed Sheep Mountain project in Wyoming.

Existing Subpart W required facilities to perform annual monitoring using Method 115 to demonstrate that the radon flux standard at conventional impoundments constructed before December 15, 1989 was below 20 pCi/m^2-sec. The proposed removal of this monitoring requirement would result in a cost saving to the three facilities for which this requirement still applies: (1) Sweetwater; (2) White Mesa; and (3) Shootaring Canyon. Method 115 requires 100 measurements as the minimum number of flux measurements considered necessary to determine a representative mean radon flux value. For the three sites that are still required to perform Method 115 radon flux monitoring, the average annual cost to perform that monitoring is estimated to be about $9,730 for Shootaring and Sweetwater, and $19,460 for White Mesa. For all three sites the total annual average cost is estimated to be $38,920 per year, with a range from approximately $28,000 to $49,500 per year. For all three sites the total annual average cost savings resulting from removal of the flux monitoring requirement would be $39,920.

Baseline costs (explained in Section IV.B) for conventional impoundment liner construction [35] will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W.

The average cost to construct one of these impoundments is $13.8 million. We estimate that this cost is approximately 3% of the total baseline capital costs to construct a conventional mill, estimated at $372 million.

We have estimated that for an average 80 acre nonconventional impoundment the average cost of construction of an impoundment is $23.7 million. Requiring impoundments to comply with the liner requirements in 40 CFR 192.32(a)(1) will contain the uranium byproduct material and reduce the potential for ground water contamination. The only economic impact attributable to the proposed rule is the cost of complying with the new requirement to maintain a minimum of one meter of water in the nonconventional impoundments during operation and standby. As shown in Section IV.B.3. of this preamble, as long as approximately one meter of water is maintained in the nonconventional impoundments the effective radon emissions from the ponds are so low that it is difficult to determine if there is any contribution above background radon values. In order to maintain one meter of liquid within a pond, it is necessary to replace the water that is evaporated from the pond. Depending on the source of water chosen,[36] we estimate that this requirement will cost owners or operators of nonconventional impoundments between $1,042 and $9,687 per year. This value also varies according to the size of the nonconventional impoundment, up to 80 acres, and the location of the impoundment. Evaporation rates vary by geographic location. However, the cost to maintain the one meter of liquid in a nonconventional impoundment is estimated to be less than 1% of the total annual production costs, estimated at $23.7 million. The requirement to maintain a minimum of one meter of liquid in the ponds is estimated to cost approximately $0.03 per pound of uranium produced.

Designing and constructing heap leach piles to meet the requirements at 40 CFR 192.32(a)(1) would minimize the potential for leakage of uranium enriched lixiviant into the ground water. Specifically, this would require that a double liner, with drainage collection capabilities, be provided under heap leach piles. Baseline costs (explained in Section IV.B) for heap leach pile liner construction will remain the same, since the proposed rule does not impose additional requirements. Liners meeting the requirements at 40 CFR 192.32(a)(1) are already mandated by other regulations and, therefore, built into the baseline cost estimate. Therefore there are consequently no costs (or benefits) resulting from the inclusion of these requirements in Subpart W. Baseline costs for construction will be essentially the same as for conventional impoundments. Since the liner systems are equivalent to the systems used for conventional and nonconventional impoundments, we have been able to estimate the average costs associated with the construction of heap leach pile impoundments that meet the liner requirements we are proposing, and compare them to the costs associated with the total production of uranium produced by the facility. The average cost of constructing such an impoundment is estimated to be approximately $15.3 million. The costs of constructing this type of liner system are about 4% of the estimated total baseline capital costs of a heap leach facility estimated at $356 million.

For heap leach piles, when the soil moisture content in the heap leach pile falls below about 30% by weight, the radon flux out of the heap leach pile increases because radon moves through the air faster (with less opportunity to decay) than through water. We concluded from our analysis that the leaching solution applied in a typical operation should be sufficient to maintain the moisture content of the heap leach pile to the required levels, and only in unusual circumstances would additional liquids need to be applied. However, in a circumstance that would require the additional application of liquid to maintain the 30% moisture limit, such as excessive evaporation, we estimate that the cost of requiring the owner/operator of a heap leach pile to maintain 30% moisture content in the pile will average approximately $4,000 per year. We also estimate that it will cost approximately $86,500 per year (which includes labor of approximately 2,000 hours) to perform the tests required to verify that the moisture content is being maintained. These costs are less than one percent of the total baseline capital costs of a heap leach facility, estimated at $356 million.

[35] These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license. Therefore, there are no projected costs (or benefits) beyond the baseline resulting from the inclusion of these requirements in Subpart W.

[36] Municipal sources were the most expensive, with average unit costs of $0.0033 per gallon. Offsite non-drinking water sources were the cheapest, at $0.000069 per gallon on average. For more detail, please see Section 6.3.3 of the Background Information Document.

In summary, we estimate that for conventional impoundments there will be no additional costs incurred through this proposed rule. There will be a cost savings of approximately $39,900 per year for the three existing conventional impoundments that are currently required to monitor for radon flux through the use of Method 115, since we are proposing to eliminate this requirement. For nonconventional impoundments we estimate that the additional costs incurred by this proposed rule will be to maintain one meter of liquid in each nonconventional impoundment, and we have estimated those costs between approximately $1,040 and $9,680 per year. For heap leach piles, additional costs incurred by this proposed rule would be for the maintaining and monitoring of the continuous 30% moisture content requirement, which we estimate will impose a one-time cost of approximately $35,000 for equipment and approximately $86,000 per year to monitor the moisture content.

C. What are the non-air environmental impacts?

Water quality would be maintained by implementation of this proposed rule. This proposed rule does contain requirements (by reference) related to water discharges and spill containment. In fact, the liner requirements cross referenced at 40 CFR 192.32(a)(1) will significantly decrease the possibility of contaminated liquids leaking from impoundments into ground water (which can be a significant source of drinking water). Section 192.32(a)(1) includes a cross-reference to the surface impoundment design and construction requirements of hazardous waste surface impoundments regulated under the Resource Conservation and Recovery Act (RCRA), found at 40 CFR 264.221. Those requirements state that the impoundment shall be designed, constructed and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil or ground water or surface water at any time during the active life of the impoundment. There are other requirements for the design and operation of the impoundment, and these include construction specifications, slope requirements, sump and liquid removal requirements.

These liner systems (conventional, nonconventional and heap leach piles)are already required by 40 CFR 192.32(a)(1), which, as explained above, are requirements promulgated by EPA under UMTRCA that are incorporated into NRC regulations and implemented and enforced by NRC through their licensing requirements. Therefore, we are not placing any additional liner requirements on facilities or requiring them to incur any additional costs to build their conventional or nonconventional impoundments or heap leach piles above and beyond what an owner or operator of these impoundments must already incur to obtain an NRC license.

Including a double liner in the design of all onsite impoundments that would contain uranium byproduct material would reduce the potential for ground-water contamination. Although the amount of the potential reduction is not quantifiable, it is important to take this into consideration due to the significant use of ground water as a source of drinking water.

VII. Statutory and Executive Orders Review

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this action is a ''significant regulatory action.'' The Executive Order defines ''significant regulatory action'' as one that is likely to result in a rule that may ''raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.'' Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011) and any changes made in response to OMB recommendations have been documented in the docket for this action.

B. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.* The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number 2464.01.

The information to be collected for the proposed rulemaking today is based on the requirements of the Clean Air Act. Section 114 authorizes the Administrator of EPA to require any person who owns or operates any emission source or who is subject to any requirements of the Act to:

—Establish and maintain records
—Make reports, install, use, and maintain monitoring equipment or method
—Sample emissions in accordance with EPA-prescribed locations, intervals and methods
—Provide information as may be requested

EPA's regional offices use the information collected to ensure that public health continues to be protected from the hazards of radionuclides by compliance with health based standards and/or Generally Available Control Technology (GACT).

The proposed rule would require the owner or operator of a uranium recovery facility to maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) meet the requirements in section 192.32(a)(1). Included in these records are the results of liner compatibility tests, measurements confirming that one meter of liquid has been maintained in nonconventional impoundments and records confirming that heap leach piles have constantly maintained at least 30% moisture content during the operating life of the heap leach pile. This documentation should be sufficient to allow an independent auditor (such as an EPA inspector) to verify the accuracy of the determination made concerning the facility's compliance with the standard. These records must be kept at the mill or facility for the operational life of the facility and, upon request, be made available for inspection by the Administrator, or his/her authorized representative. The proposed rule would not require the owners or operators of operating impoundments and heap leach piles to report the results of the compliance inspections or calculations required in Section 61.255. The recordkeeping requirements require only the specific information needed to determine compliance. We have taken this step to minimize the reporting requirements for small business facilities.

The annual proposed monitoring and recordkeeping burden to affected sources for this collection (averaged over the first three years after the effective date of the proposed rule) is estimated to be 10,400 hours with a total annual cost of $400,000. This estimate includes a total capital and start-up cost component annualized over the facility's expected useful life, a total operation and maintenance component, and a purchase of services component. We estimate that this total burden will be spread over 21 facilities that will be required to keep records. Of this total burden, however, 4,150 hours (and $93,000) will be incurred by the one heap leach uranium recovery facility,

due to the requirements for purchasing, installing and monitoring the soil moisture sensors, as well as training staff on how to operate the equipment.

Burden is defined at 5 CFR 1320.3(b). An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR part 9.

To comment on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, EPA has established a public docket for this rule, which includes this ICR, under Docket ID number EPA–HQ–OAR–2008–0218. Submit any comments related to the ICR to EPA and OMB. See **ADDRESSES** section at the beginning of this notice for where to submit comments to EPA. Send comments on the ICR to OMB to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street NW., Washington, DC 20503, Attention: Desk Office for EPA. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after May 2, 2014, a comment to OMB is best assured of having its full effect if OMB receives it by June 2, 2014. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business whose company has less than 500 employees and is primarily engaged in leaching or beneficiation of uranium, radium or vanadium ores as defined by NAIC code 212291; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this proposed rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This proposed rule is estimated to impact approximately 18 uranium recovery facilities that are currently operating or plan to operate in the future.

To evaluate the significance of the economic impacts of the proposed revisions to Subpart W, separate analyses were performed for each of the three proposed GACTs.

The GACT for uranium recovery facilities that use conventional milling techniques proposes that only phased disposal units or continuous disposal units be used to manage the tailings. For either option, the disposal unit must be lined and equipped with a leak detection system, designed in accordance with part 192.32(a)(1). If phased disposal is the option chosen, the rule limits the disposal unit to a maximum of 40 acres, with no more than two units open at any given time. If continuous disposal is chosen, no more than 10 acres may be open at any given time. Finally, the Agency is proposing to eliminate the distinction that was made in the 1989 rule between impoundments constructed pre-1989 and post-1989 since all of the remaining pre-1989 impoundments comply with the proposed GACT. The elimination of this distinction also eliminates the requirement that pre-1989 disposal units be monitored on an annual basis to demonstrate that the average Rn-222 flux does not exceed 20 $pCi/m^2/sec$.

The conventional milling GACT applies to three existing mills and one proposed mill that is in the process of being licensed. The four conventional mills are: the White Mesa mill owned by Energy Fuels Resources (USA); the Shootaring Canyon mill owned by Uranium One, Inc.; the Sweetwater mill owned by Kennecott Uranium Co.; and the proposed Piñon Ridge mill owned by Energy Fuels, Inc. Of the three companies that own conventional mills, none are classified as small businesses using fewer than 500 employees as the classification criterion.

Energy Fuels White Mesa mill uses a phased disposal system that complies with the proposed GACT. When its existing open unit is full it will be contoured and covered and a new unit, constructed in accordance with the proposed GACT, will be opened to accept future tailings. Energy Fuels is proposing a phased disposal system to manage its tailings; this system also complies with the proposed GACT.

Based on the fact that both small entities are in compliance with the proposed GACT, we conclude that the rulemaking will not impose any new economic impacts on either facility. For Energy Fuels Mines, the proposed rule will actually result in a cost saving as it will no longer have to perform annual monitoring to determine the average radon flux from its impoundments.

The GACT for evaporation ponds at uranium recovery facilities requires that the evaporation ponds be constructed in accordance with design requirements in part 192.32(a)(1) and that a minimum of 1 meter of liquid be maintained in the ponds during operation and standby. The key design requirements for the ponds are for a double-liner with a leak detection system between the two liners.

In addition to the four conventional mills identified above, the GACT for evaporation ponds applies to in-situ leach facilities and heap leach facilities. Currently, there are five operating ISL facilities and no operating heap leach facilities. The operating ISLs are Crow Butte and Smith Ranch owned by Cameco Resources, Alta Mesa owned by Mestena Uranium, LLC, Willow Creek owned by Uranium One, Inc., and Hobson owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

All of the evaporation ponds at the four conventional mills and the five ISL facilities were built in conformance with part 192.32(a)(1). Therefore, the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The proposed revisions to Subpart W apply to five currently operating ISL facilities. The operating facilities are Crow Butte (Nebraska) and Smith Ranch (Wyoming), owned by Cameco Resources; Alta Mesa (Texas), owned by Mestena Uranium, LLC; Willow Creek (Wyoming), owned by Uranium One, Inc.; and Hobson (Texas), owned by Uranium Energy Corp. Again using the fewer than 500 employees' criterion, Mestena Uranium, LLC and Uranium Energy Corp are both small businesses, while Cameco Resources and Uranium One, Inc. are both large businesses.

In addition to the five operating ISL facilities, three additional ISL facilities have been licensed, all in the state of Wyoming. These are: Lost Creek, owned by Ur-Energy Inc.; Moore Ranch, owned by Uranium One, Inc.; and Nichols Ranch, owned by Uranerz Uranium Corp. Of these three companies, both Ur-Energy Inc. and Uranerz Uranium Corp. are small businesses.

Eleven other ISL facilities have been proposed for licensing. These include: Dewey-Burdock (South Dakota) and Centennial (Colorado), both owned by Powertech Uranium Corp.; and Kingsville Dome, Los Finados, Rosito, and Vasques (Texas), all owned by Uranium Resources Inc.; Crownpoint (New Mexico), also owned by Uranium Resources Inc., Church Rock (New Mexico), owned by Strathmore Minerals; Ross (Wyoming), owned by Strata Energy, Inc., Goliad (Texas), owned by Uranium Energy Corp.; and Antelope-Jab (Wyoming), owned by Uranium One, Inc. All of these companies, except for Uranium One, Inc. are small businesses.

According to the licensing documents submitted by the owners of the proposed ISL facilities, all will be constructed in conformance with part 192.32(a)(1). Therefore the only economic impact is the cost of complying with the new requirement to maintain a minimum of 1 meter of water in the ponds during operation and standby.

The requirement to maintain a minimum of 1 meter of liquid in the ponds is estimated to cost up to $0.03 per pound of U_3O_8 produced. This cost is not a significant impact on any of these small entities.

Although there are no heap leach facilities currently licensed, Energy Fuels, Inc. is expected to submit a licensing application for the Sheep Mountain Project. From the preliminary documentation that Titan presented (now owned by Energy Fuels), the facility will have an Evaporation Pond, a Collection Pond, and a Raffinate Pond. All three ponds will be double lined with leak detection. However, as Energy Fuels is a large business, it does not affect the determination of impacts on small businesses.

The GACT for heap leach facilities applies the phased disposal option of the GACT for conventional mills to these facilities and adds the requirement that the heap leach pile be maintained at a minimum 30 percent moisture content by weight during operations.

As noted previously, there are no heap leach facilities currently in existence, and the only one that is known to be preparing to submit a license application is being proposed by Energy Fuels, which is a large business.

Of the 20 facilities identified above, 15 are owned by small businesses. No small organizations or small governmental entities have been identified that would be impacted by the proposed GACTs. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

D. Unfunded Mandates Reform Act

This rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local and tribal governments, in the aggregate, or the private sector in any one year. The proposed rule imposes no enforceable duties on any State, local or Tribal governments or the private sector. Thus, this rule is not subject to the requirements of sections 202 or 205 of UMRA.

This rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments because it contains no requirements that apply to such governments nor does it impose obligations upon them.

E. Executive Order 13132: Federalism

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. None of the facilities subject to this action are owned and operated by State governments, and, nothing in the proposed rule will supersede State regulations. Thus, Executive Order 13132 does not apply to this proposed rule.

In the spirit of Executive Order 13132 and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). The action imposes requirements on owners and operators of specified area sources and not tribal governments. Thus, Executive Order 13175 does not apply to this action.

EPA specifically solicits additional comment on this proposed action from tribal officials.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

EPA interprets EO 13045 (62 FR 19885, April 23, 1997) as applying to those regulatory actions that concern health or safety risks, such that the analysis required under section 5–501 of the Order has the potential to influence the regulation. This action is not subject to EO 13045 because it is based solely on technology performance.

H. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not a ''significant energy action'' as defined in Executive Order 13211 (66 FR 28355 (May 22, 2001)), because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This proposed rule will not adversely directly affect productivity, competition, or prices in the energy sector.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (''NTTAA''), Public Law 104–113, 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This proposed rulemaking does not involve technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

We request public comment on this aspect of the proposed rulemaking, and specifically, ask you to identify potentially applicable voluntary consensus standards and to explain why such standards could be used in this regulation.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this proposed rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it increases the level of environmental protection for all affected populations without having any disproportionately high and adverse human health or environmental effects on any population, including any minority or low-income population. This proposed rule would reduce toxics emissions of radon from nonconventional impoundments and heap leach piles and thus decrease the amount of such emissions to which all affected populations are exposed.

List of Subjects in 40 CFR Part 61

Environmental protection, Air pollution control, Hazardous substances, Radon, Tailings, Byproduct, Uranium, Reporting and recordkeeping requirements.

Dated: April 17, 2014.

Gina McCarthy,

Administrator.

For the reasons stated in the preamble, the Environmental Protection Agency proposes to amend title 40, Chapter I of the Code of Federal Regulations as follows:

PART 61—[NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS]

■ 1. The authority citation for part 61 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

Subpart W—[National Emission Standards for Radon Emissions From Operating Mill Tailings]

■ 2. Section 61.251 is amended by revising the definition for (e) and adding new definitions for (h–m) as follows:

§ 61.251 Definitions.

* * * * *

(e) *Operation.* Operation means that an impoundment is being used for the continued placement of uranium byproduct materials or tailings or is in standby status for such placement. An impoundment is in operation from the day that uranium byproduct materials or tailings are first placed in the impoundment until the day that final closure begins.

* * * * *

(h) *Conventional Impoundment.* A conventional impoundment is a permanent structure located at any uranium recovery facility which contains mostly solid uranium byproduct material from the extraction of uranium from uranium ore. These impoundments are left in place at facility closure.

(i) *Non-Conventional Impoundment.* A non-conventional impoundment can be located at any uranium recovery facility and contains uranium byproduct material suspended in and/or covered by liquids. These structures are commonly known as holding ponds or evaporation ponds. They are removed at facility closure.

(j) *Heap Leach Pile.* A heap leach pile is a pile of uranium ore placed on an engineered structure and stacked so as to allow uranium to be dissolved and removed by leaching liquids.

(k) *Standby.* Standby means the period of time that an impoundment may not be accepting uranium byproduct materials but has not yet entered the closure period.

(l) *Uranium Recovery Facility.* A uranium recovery facility means a facility licensed by the NRC or an NRC Agreement State to manage uranium byproduct materials during and following the processing of uranium ores. Common names for these facilities are a conventional uranium mill, an in-situ leach (or recovery) facility and a heap leach facility or pile.

(m) *Heap Leach Pile Operational Life.* The operational life of a heap leach pile means the time that lixiviant is first placed on the heap leach pile until the time of the final rinse.

■ 3. Section 61.252 is revised to read as follows:

§ 61.252 Standard.

(a) Conventional Impoundments.

(1) Conventional impoundments shall be designed, constructed and operated to meet one of the two following management practices:

(i) *Phased disposal* in lined tailings impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two conventional impoundments, including existing impoundments, in operation at any one time.

(ii) *Continuous disposal* of tailings such that tailings are dewatered and immediately disposed with no more than 10 acres uncovered at any time and shall comply with the requirements of 40 CFR 192.32(a)(1).

(b) *Non-Conventional Impoundments.* Non-conventional impoundments shall meet the requirements of 40 CFR 192.32(a)(1). During operation and until final closure begins, the liquid level in the impoundment shall not be less than one meter.

(c) *Heap Leach Piles.* Heap leach piles shall comply with the phased disposal management practice in 40 CFR 61.252(a)(1)(i). Heap leach piles shall be constructed in lined impoundments that are no more than 40 acres in area and shall comply with the requirements of 40 CFR 192.32(a)(1). The owner or operator shall have no more than two heap leach piles, including existing heap leach piles, in operation at any one time. The moisture content of heap leach piles shall be maintained at 30% or greater. The moisture content shall be determined on a daily basis, and performed using generally accepted geotechnical methods. The moisture content requirement shall apply during the heap leach pile operational life.

§ 61.253 [Removed]

■ 4. Section 61.253 is removed.

§ 61.254 [Removed]

■ 5. Section 61.254 is removed.

■ 6. Section 61.255 is revised to read as follows:

§ 61.255 Recordkeeping requirements.

(a) The owner or operator of any uranium recovery facility must maintain records that confirm that the conventional impoundment(s), nonconventional impoundment(s) and heap leach pile(s) at the facility meet the requirements in 40 CFR 192.32(a)(1). These records shall include, but not be limited to, the results of liner compatibility tests.

(b) The owner or operator of any uranium recovery facility with nonconventional impoundments must maintain records that include measurements confirming that one meter of liquid has been maintained in the nonconventional impoundments at the facility.

(c) The owner or operator of any heap leach facility shall maintain records confirming that the heap leach piles maintained at least 30% moisture content by weight during the heap leach pile operational life.

(d) The records required in paragraphs (a), (b) and (c) above must be kept at the uranium recovery facility for the operational life of the facility and must be made available for inspection by the Administrator, or his authorized representative.

[FR Doc. 2014–09728 Filed 5–1–14; 8:45 am]

BILLING CODE 6560–50–P

NTAA

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928.523.0526 office
928.523.1266 fax

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004

June 12, 2014

Reid J. Rosnick
Office of Radiation and Indoor Air
Radiation Protection Division
U.S. Environmental Protection Agency
Via email to rosnick.reid@epa.gov

Dear Mr. Rosnick,

The National Tribal Air Association (NTAA) is an autonomous organization with 80 principal member Tribes. The organization's mission is to advance air quality management policies and programs, consistent with the needs, interests, and unique legal status of Indian Tribes. As such, the NTAA uses its resources to support the efforts of all federally recognized Tribes in protecting and improving the air quality within their respective jurisdictions.

On behalf of the NTAA, I am writing to request that EPA extend the public comment period for the proposed rule issued in the Federal Register on May 2, 2014, which would revise Subpart W of 40 CFR Part 61, "*National Emission Standards for Operating Uranium Mill Tailings*". Specifically, the *NTAA is requesting the maximum comment extension period of 120 days*.

This rule addresses both conventional uranium milling operations as well as future extraction activities, namely in-situ leach/recovery (ISL) sites. Domestic uranium milling and mining operations to date have left in their wake a disturbing legacy of environmental injustice in Indian Country. As a national organization whose mission it is to advance air quality management and policies for federally recognized Tribes, it is only prudent that NTAA thoroughly evaluate the consequences of the proposed rule, including the potential impacts on Tribal communities, and subsequently provide comments to EPA. Given the serious complexity of the proposed rule, as well as the wide ranging implications for affected tribes, we strongly request that you grant the aforementioned extension.

For our part, NTAA was only made aware of the proposed rule within the last two weeks. The public comment extension will help to promote a just and equitable public participation process by giving the NTAA, member tribes, and those Tribes indicated on EPA's consultation list adequate time to examine the complex science and the associated human health considerations embodied in the proposed rule.

Sincerely,

Bill Thompson
Chairman, NTAA

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:20 PM
To: Thornton, Marisa
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

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From: Thornton, Marisa
Sent: Wednesday, June 11, 2014 2:57 PM
To: Rosnick, Reid
Subject: RE: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Done - http://epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html#documents

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From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 2:31 PM
To: Thornton, Marisa
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

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From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 11:14 AM
To: Miller, Beth
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Hi Beth,

Please post this email and request (separately) to the website.

Then, please post just the request to the docket. Thanks!

Reid

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, June 10, 2014 3:44 PM
To: Rosnick, Reid
Subject: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Dear Mr. Rosnick,

Attached is a request for extension of time to submit comments on the EPA 40 C.F.R.Part 61 Subpart W Rulemaking and a request for hearing.

Thank you,

Sarah Fields

PO Box 344
Moab, Utah 84532
435-260-8384

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:22 PM
To:	Thornton, Marisa
Subject:	FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 1:52 PM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Angelique:

Thanks for all your help—I'm sorry this is proving to be such a hassle. We basically need to hold the meetings in August. Would it be possible to book any two consecutive days during the week of August 18? Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Wednesday, June 11, 2014 12:55 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, there are no rooms available on those dates. I am having our scheduler check in August and September for rooms that are available for 2 days in a row. I'll let you know when I hear back from her.

-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:22 PM
To: Thornton, Marisa
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing
Attachments: HearingRequest.140610.pdf

From: Miller, Beth
Sent: Wednesday, June 11, 2014 1:10 PM
To: Thornton, Marisa
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

I hate to put this on you. Thanks

Please consider the environment before printing this e-mail.

Beth Miller
202-343-9223

From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 11:14 AM
To: Miller, Beth
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Hi Beth,

Please post this email and request (separately) to the website.

Then, please post just the request to the docket. Thanks!

Reid

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, June 10, 2014 3:44 PM
To: Rosnick, Reid
Subject: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Dear Mr. Rosnick,

Attached is a request for extension of time to submit comments on the EPA 40 C.F.R.Part 61 Subpart W Rulemaking and a request for hearing.

Thank you,

Sarah Fields
PO Box 344
Moab, Utah 84532
435-260-8384

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick:

REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

Uranium Watch requests a 60-day extension of the time period to submit comments on the Environmental Protection Agency's (EPA's) Proposed Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings, 49 C.F.R. Part 61 Subpart W, Docket ID No. EPA–HQ– OAR–2008–0218. 79 Fed. Reg. 25388, May 2, 2014.

The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

This incorrect factual claim regarding the Shootaring Canyon Mill and other misinformation, misleading information, incomplete information, and outdated information require a commenter to carefully review the proposed rule and supporting documents. Also, the EPA has asked for commenters' thoughts on various aspects of the proposed rule. These lengthy and detailed research and comment preparations require additional time in order to frame informed comments.

REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

Thank you for consideration of this request.

Sincerely,

Sarah Fields
sarah@uraniumwatch.org

---

[1] http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:22 PM
To:	Thornton, Marisa
Subject:	FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Diaz, Angelique
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Cc: Rosnick, Reid
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Angelique D. Diaz, Ph.D.
Environmental Engineer
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1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Whitney and Angelique:

We want to reschedule the hearings. Might you have rooms available on August 26-27?

Thanks, as always for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, May 19, 2014 4:13 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney

Thanks for the update.
Mary

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:22 PM
To: Thornton, Marisa
Subject: FW: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills
Attachments: DMC 2013 Activities.pdf; DMC Image-2013.pdf

-----Original Message-----
From: Harrison, Jed
Sent: Wednesday, June 11, 2014 2:39 PM
To: Flynn, Mike; Edwards, Jonathan; Rosnick, Reid
Subject: FW: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

I had mentioned Subpart W Proposed revision on an earlier NTAA call. Andy Bessler from NTAA followed up with NTAA tribes. Twa-le Abrahmason-Swan from Spokane tribe is interested and is pulling NTAA in. I really didn't expect NTAA get involved, but it is good that they see themselves connecting with (as Twa-le say's it) the R in OAR.

-----Original Message-----
From: Mehrdad - Khatibi [mailto:Mehrdad.Khatibi@nau.edu]
Sent: Wednesday, June 11, 2014 11:12 AM
To: Harrison, Jed
Subject: FW: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

FYI

Mehrdad Khatibi
Director
Institute for Tribal Environmental Professionals Northern Arizona University Phone (928) 523-0946
Fax: (928) 523-1266
http://www4.nau.edu/itep/

Virgil Masayesva Native American Environmental Education Scholarship A scholarship fund has been established at Northern Arizona University in recognition of Virgil Masayesva and his tireless pursuit to advance Native American environmental education and protection issues around the country. For more information, or to make a tax-deductible donation please click on the link above.

ITEP is now on Facebook! Become a Fan!

-----Original Message-----
From: Twale Abrahamson [mailto:twalea@SpokaneTribe.com]
Sent: Wednesday, June 11, 2014 9:20 AM
To: Andy Bessler; air@lldrm.org
Cc: Bill.Thompson@penobscotnation.org; angela.benedict@srmt-nsn.gov; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; Cristina Gonzalez-Maddux; childers.pat@epa.gov; Mehrdad - Khatibi
Subject: RE: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Thank you for catching this one. We are one of many Tribes dealing with uranium mines and mills, it has been extremely difficult finding expertise within EPA and within certain regions, like 10 on regulations like this. A formalized working/technical assistance group for Tribes would be extremely helpful. We need more help with the "R" in ORIA.

Here's an article from the Ute Mtn Ute Tribe, the mining company operating on our Reservation is in negotiations with this mill to accept and process the waste from the water treatment plant at Midnite Mine.
http://fourcornersfreepress.com/?p=575

I've also attached a picture summary of activities at the Dawn Millsite for 2013. One thing we are dealing with, and is a concern to Tribal members in our community is the continued taking of clean lands for fill materials to cover these sites. Their estimates are too low to meet current radon guidelines, they have to keep adding more and more topsoil. Newmont Mining Co, continues to buy fee lands on and adjacent to the Spokane Reservation for fill material and they are clear-cutting lands and basically mining more topsoil. The pond in the photos needed double the amount of soil cover they planned for. For the Midnite Mine cleanup, they are only estimating 3 feet of topsoil to cover the entire site, it seems like a very low estimate.

http://www.spokesman.com/stories/2014/apr/28/spokane-tribe-members-want-more-time-to-review/

I'd like to help with this one, and hopefully learn more in the process. There is also a new regulation on waste transport that has interest to Tribes. I haven't got far trying to track information down on this one either, I was trying to ask them how Tribes need to participate to start getting this notification.

Materials rules - advance notice to tribal governments On April 7, 2014, the department adopted the federal Nuclear Regulatory Commission's rule change titled "2012-2: Advance notification to Native American tribes of transportation of certain types of nuclear waste."

CR103 Rule-Making Order (PDF).
Final rule language (PDF).

Effective May 8, 2014, these changes amend rules that govern packaging and transportation of radioactive material and physical protection of plants and materials. The amendments require

licensees to give advance notice to participating federally recognized tribal governments about shipments of irradiated reactor fuel and certain nuclear wastes that pass within or across their reservations.
If you have any questions about the proposed rule changes, contact Curt DeMaris, Radiation Health Physicist, Materials Section, at 360-236-3223.

Twa-le

Twa-le Abrahamson-Swan
Air Quality Coordinator
Spokane Tribal Natural Resources
www.spokanetribe.com/air-quality
509-626-4403
twalea@spokanetribe.com

____
From: Andy Bessler [Andy.Bessler@nau.edu]
Sent: Wednesday, June 11, 2014 8:18 AM
To: air@lldrm.org
Cc: Bill.Thompson@penobscotnation.org; angela.benedict@srmt-nsn.gov; bhoover@ldftribe.com; joseph.painter@winnebagotribe.com; katerenw@nc-cherokee.com; kelliej@pawneenation.org; greenleaf@kootenai.org; lweeks@nemont.net; santeeair@gmail.com; rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org; sflensburg@bbna.com; tammy.belone@jemezpueblo.org; Twale Abrahamson; Cristina Gonzalez-Maddux; childers.pat@epa.gov; Mehrdad - Khatibi
Subject: Re: Draft NTAA Extension Request on EPA draft rule on radon emissions from Uranium Mills

Great thanks for the feedback. We will craft some additional language and send another draft out later today.

Andy

>

Dawn Millsite October 2013

2013 Dawn Millsite Construction/Investigation Activities Information

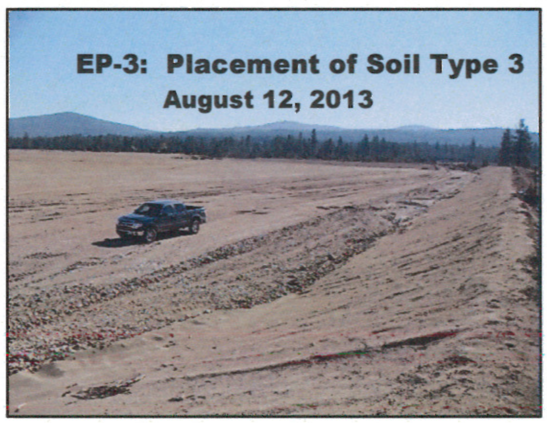
All work completed in 2013 unless noted.

Evaporation Ponds EP-2, 3, and 4 were cleaned and decommissioned

- EP-2 is 28.3 acres - cleaning from July to October
- EP-3 is 16.9 acres - cleaning from May to June
- EP-4 is 12.7 acres – cleaning from June to July

Radon Barrier soil placement over TDA 1-3 in EP-2, 3, and 4

- Construction - June through November;
- 656,847 cy soil placed through November 20.
- Average 6.5-foot thickness of soil over 61 acres.
- Approximately 42% of total TDA 1-3 cover installed.



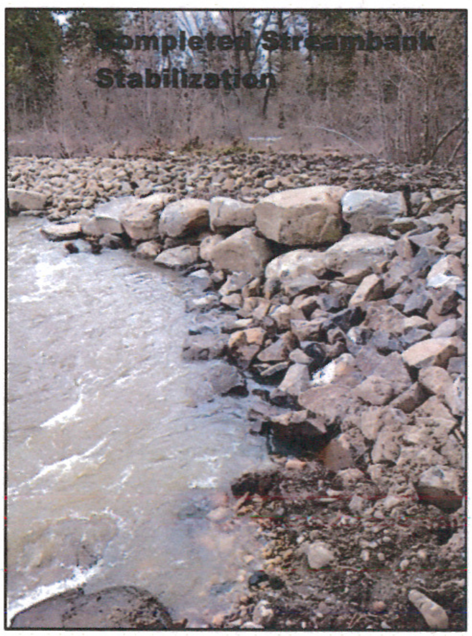
EP-6 Construction

- Four double-lined cells with leak detection; 120 ac-feet total storage capacity
- Construction started May 2013 and completed August 2013.
- 87,000 cy of fill excavated and placed to construct embankments; 10,600 cy bedding sand

- 638,000 sf of primary and secondary HDPE liner and geogrid
- Started filling with EP-2 process water in July; filling completed in October with cells 3 and 4 completely full, cell two approximately ¾ full, and cell one empty.

Chamokane Creek Bank Stabilization

- Streambank stabilization and restoration of the eroded south bank of Chamokane Creek to protect the adjacent wetland and pond.
- Work included: installing riprap, streambarbs, large woody structures, and plantings along the streambank.
- Construction started February 12 and was completed on February 20 by Knight Construction & Supply, Inc.
- Revegetation started on April 29, and was completed April 30.



Millsite Building Asbestos Inspection

- AES conducted building assessments, inspections, and material sampling for asbestos-containing materials from March 4th through March 8th; analysis and reporting in progress.
- Inspected buildings include: Administrative Office, Safety Trailer, Dry, Lab, Garage, Shop, Boiler Room, Mill Pump House, Spring Pump House, and Morgan former residence.

Fence Installation around Scour Pond in Lower North Area

- 1,500 feet of 6-foot high chain-link fence with barbless wire and two gates installed in May.
- Work was completed by Idaho Fence Co.

Lower North Area Gamma Exposure Rate Survey

- Work Plan Completed by Tetra Tech, May 15, 2013.
- Survey completed, reporting in progress.

Meadow Area Gamma Exposure Rate Survey

- Work Plan Completed by Tetra Tech, May 15.
- Survey completed, reporting in progress.

Ore Stockpile Area Soil Sampling For Further Characterization of the Uranium Source

- Work Plan Completed by Tetra Tech, May 15
- Excavated and sampled twenty-five test pits in the ore stockpile area. One sample collected per test pit location completed on June 26.
- Analyzed samples for Ra-226, Th-230, and U-nat.
- WME summary report submitted to DOH on October 14.

Ore Stockpile and Lower North Area Hydrogeologic, Geochemical, and Geotechnical Investigation

- Work Plan Completed by Hydro-Logic LLC, July 10.
- 5 wells installed in SA; 1 borehole drilled.
- 6 wells installed in LNA.
- 19 soil samples from soil drill cores sent for geotechnical testing & 10 soil samples from drill cores sent for geochemical (K_d) testing.
- Laboratory analysis and reporting in progress; anticipated submittal date of December 31, 2013.

Lower North Area Vegetation and Soil Sampling

- Work Plan completed by WME, LLC. September 10.
- Sampling completed in September with 12 vegetation samples and 16 soil samples submitted to the laboratory.
- Laboratory analysis and reporting in progress; anticipated submittal date of January 10, 2014.

WME, LLC
December 16, 2013

Evaporation Pond Embankment Material Sampling and Analysis

- Work Plan completed by WME, LLC. September 25, 2013.
- Sampling completed October 16, 2013 with 71 samples submitted to the laboratory.
- Laboratory data received the week of December 9, 2013; analysis and reporting in progress.

Midnite Mine Water Treatment Plant Sludge Disposal in TDA-4

- Water Treatment Plant operating from April through October 2013.
- 693 cy of sludge placed in TDA-4 from April through October 2013.
- Approximately 600 cy of ST2 cover material placed by MCE over the sludge.

Aerial Photography

- Aerial Photography completed on October 17, 2013 by 3Di GeoTerra Mapping Group
- Topographic Map produced with horizontal and vertical control provided by Benthin and Associates.

Demolition at Former Morgan Residence

- Asbestos building inspection completed by AES in March 2013.
- Demolition and disposal of buildings anticipated to be completed by MCE by the end of 2013.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:23 PM
To: Thornton, Marisa
Subject: FW: Extension of Comment Period for Subpart W
Attachments: fr-cover-form-3-20-2014.pdf

From: Lee, Raymond
Sent: Wednesday, June 11, 2014 11:40 AM
To: Rosnick, Reid
Subject: RE: Extension of Comment Period for Subpart W

Hi Reid,

Hah! I should've included the blank form in my first e-mail – my apologies. Here you go!

Thanks,

Ray

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond(

From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 11:26 AM
To: Lee, Raymond
Subject: RE: Extension of Comment Period for Subpart W

Thanks Ray,

Where do I find the blank checklist?

From: Lee, Raymond
Sent: Wednesday, June 11, 2014 10:53 AM
To: Rosnick, Reid
Cc: Peake, Tom; Schultheisz, Daniel
Subject: RE: Extension of Comment Period for Subpart W

Hi Reid,

Luckily, the package for a comment period extension is much simpler. I've attached examples of all the documents we used for Brian's recently.

Let me know if you have any questions.

Thanks!

Ray

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond(

From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 9:51 AM
To: Lee, Raymond
Cc: Peake, Tom; Schultheisz, Daniel
Subject: Extension of Comment Period for Subpart W

Hi Ray,

I know that we just did this for Brian. Can you please tell me what I need for an extension of the comment period for Subpart W? Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Cover Form and Checklist for *Federal Register* (FR) Document Submissions to the Office of Policy (OP)

Section 1: Tracking information

Contact name: Office/Region: (choose one)

Contact phone and email:

Docket # *(if applicable)*: FRL # *(if applicable)*:

Name of document:

Name of File:

Other Information (alternate contacts, etc.):

Section 2: Requested Handling

You must select either Option 1 or Option 2.

☐ **Option 1: No Special Handling is Requested**. *Select this option if the special handling requests identified in Option 2 do not apply to your document. If you select this option, OP will submit your document to the OFR for publication without any special requests.*

☐ **Option 2: Special Handling is Requested.** *Select this option if one or more of the following apply to your document--and select all requests that apply.*

☐ **We need to SUBMIT to or PUBLISH in FR by a SPECIFIC DATE.** This document must be (choose one) Reason: (choose one)

Explain other:

This request is reserved to satisfy the requirements of court or meet the needs of senior policy officials. The FR team may ask for additional documentation. Before you request a modified schedule, please review our timetable at http://intranet.epa.gov/adplibrary/adp-milestones/fedreg.htm#schedule.

☐ **We need OFR to REVIEW and APPROVE the IBR contained in this rule**. The relevant IBR memo or letter and materials are attached.

☐ **We need to MANAGE the FR publication of multiple FR documents.** This document must (choose one) (choose one) the following FR document (choose one)

Title:

Docket # *(if applicable)*:

FRL *(if applicable)*: Published on *(if applicable):*

☐ **We need OFR to confirm their receipt of this FR document:** Select this option ONLY if you need to ask OFR to provide a confirmation of receipt in order to document EPA's compliance with a legal requirement to submit the document to OFR by a specific date.

More information about FR Publication can be found on our website: **http://intranet.epa.gov/adplibrary/adp-milestones/fedreg.htm**

Section 3: Checklist for Document Format and Package Components

The following section provides formatting requirements for materials included in a submission package. Requirements are based on OFR's Document Drafting Handbook. Failure to adhere to these requirements could delay the publication of your document.

☐ 1. EPA's Billing Code is present **(6560-50-P)** on original and each copy, on the first page of each document in the upper right corner.

☐ 2. The **title** is concise, does not contain overly specific information, and does not contain legal citations.

☐ 3. The **SUMMARY** section is no longer than one page.

☐ 4. The **SUMMARY** section does not contain legal citations *(i.e., CFR citations, FR citations, USC citations, etc.).*

☐ 5. The **DATES** section is labeled "**DATES**" *(Not "EFFECTIVE DATES", etc.).*

☐ 6. The **Table of Contents**, if included, matches the headings in the preamble.

7. **Signature Block – Original Paper Version***

- ☐ a. The signature block contains a legible date.
- ☐ b. The signer's name and title are typed or printed under the signature line.
- ☐ c. *(if applicable)* "Acting" is added, in front of the title, if a person other than the official holder of that title is acting in that capacity. *(Note: no "for" is permitted in the signature block)*
- ☐ d. Any changes are initialed and dated. (*For example, corrections to make the typed or printed name match the signature are made by striking through the incorrect name, and initialitng and dating the correction.)*
- ☐ e. No White-Out or corrective tape is used on the signature page.

8. **Signature Block – Word File***

- ☐ a. The signature page matches items 7a – c above.
- ☐ b. The date is spelled out, with a period at the end. *(Example: "February 6, 2014.")*

☐ 9. A rewritable CD **(CD-RW)** is included with the package. *(CD-R or DVD-RW are not acceptable)*

10. The CD-RW contains:

- ☐ a. the **(1) most recent Word version** of document that (2) **matches the original**,
- ☐ b. a scanned copy of the typesetting request form, and
- ☐ c. a scanned copy of the (signed) signature page.

☐ 11. The **original** document is **single-sided**, and each **copy** is **double-sided**.

☐ 12. The correct number of copies are included. This number will depend on the type of document you are submitting. See FR publishing website, under "Who do I submit my document to? How?"

Section 4: Certification and Signature

I certify that the CD-RW I am submitting as part of this package includes the **most recent Word file** of the document and matches the copies and the original included in this package.

Date/Signature of Contact Regarding Submitted Package

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:23 PM
To: Thornton, Marisa
Subject: FW: Extension of Comment Period for Subpart W

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Ray

Ray Lee | Center for Radiation Information and Outreach (CRIO) | US EPA | Phone 202.343.9463 | Fax 202.343.2305 | lee.raymond(

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US Environmental Protection Agency
Radiation Protection Division
202.343.9563
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Attachments: HearingRequest.140610.pdf

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Sent: Wednesday, June 11, 2014 11:14 AM
To: Miller, Beth
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Hi Beth,

Please post this email and request (separately) to the website.

Then, please post just the request to the docket. Thanks!

Reid

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Sent: Tuesday, June 10, 2014 3:44 PM
To: Rosnick, Reid
Subject: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Dear Mr. Rosnick,

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Thank you,

Sarah Fields
PO Box 344
Moab, Utah 84532
435-260-8384

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

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REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

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The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

This incorrect factual claim regarding the Shootaring Canyon Mill and other misinformation, misleading information, incomplete information, and outdated information require a commenter to carefully review the proposed rule and supporting documents. Also, the EPA has asked for commenters' thoughts on various aspects of the proposed rule. These lengthy and detailed research and comment preparations require additional time in order to frame informed comments.

REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

Thank you for consideration of this request.

Sincerely,

Sarah Fields
sarah@uraniumwatch.org

---

[1] http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:23 PM
To: Thornton, Marisa
Subject: FW: Rescheduling the hearing: might you have rooms available on August 26-27

From: Diaz, Angelique
Sent: Wednesday, June 11, 2014 10:59 AM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Rescheduling the hearing: might you have rooms available on August 26-27

Tony, I am checking into it. Stay tuned.

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Nesky, Anthony
Sent: Wednesday, June 11, 2014 8:55 AM
To: Diaz, Angelique; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: Rescheduling the hearing: might you have rooms available on August 26-27

Dear Whitney and Angelique:

We want to reschedule the hearings. Might you have rooms available on August 26-27?

Thanks, as always for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Diaz, Angelique
Sent: Monday, May 19, 2014 4:13 PM
To: Nesky, Anthony; Trulove-Cranor, Whitney
Cc: Rosnick, Reid
Subject: RE: Voice Mail message

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:23 PM
To: Thornton, Marisa
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing
Attachments: HearingRequest.140610.pdf

Importance: High

From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 6:36 AM
To: Stahle, Susan
Cc: Edwards, Jonathan; Peake, Tom; Schultheisz, Daniel; Herrenbruck, Glenna; Nesky, Anthony
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing
Importance: High

Hi Sue,

FYI. Sarah is requesting a 60 day extension and a request that a hearing take place in White Mesa, UT. Considering that we are already extending the comment period, please advise on next steps . Thanks.

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, June 10, 2014 3:44 PM
To: Rosnick, Reid
Subject: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Dear Mr. Rosnick,

Attached is a request for extension of time to submit comments on the
EPA 40 C.F.R.Part 61 Subpart W Rulemaking and a request for hearing.

Thank you,

Sarah Fields
PO Box 344
Moab, Utah 84532
435-260-8384

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick:

REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

Uranium Watch requests a 60-day extension of the time period to submit comments on the Environmental Protection Agency's (EPA's) Proposed Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings, 49 C.F.R. Part 61 Subpart W, Docket ID No. EPA–HQ– OAR–2008–0218. 79 Fed. Reg. 25388, May 2, 2014.

The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

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REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

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Sincerely,

Sarah Fields
sarah@uraniumwatch.org

---

[1] http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:23 PM
To:	Thornton, Marisa
Subject:	FW: EPA Subpart W Rulemaking - Request for Extension of Time and Hearing
Attachments:	HearingRequest.140610.pdf

From: Nesky, Anthony
Sent: Tuesday, June 10, 2014 7:59 PM
To: Rosnick, Reid; Stahle, Susan; Peake, Tom
Cc: Herrenbruck, Glenna
Subject: FW: EPA Subpart W Rulemaking - Request for Extension of Time and Hearing

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, June 10, 2014 7:58 PM
To: Nesky, Anthony
Cc: Group A-AND-R-DOCKET
Subject: EPA Subpart W Rulemaking - Request for Extension of Time and Hearing

Dear Mr. Nesky,

Attached is letter I sent to Reid Rosnick requesting an extension of time for the public to submit comments and a request for hearing at White Mesa, near the only operating conventional uranium mill in the US.

Thank you,

Sarah Fields
Uranium Watch

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

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Uranium Watch

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

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Sarah Fields
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************************ ATTACHMENT REMOVED ************************

This message contained an attachment which the administrator has caused
to be removed.

************************ ATTACHMENT REMOVED ************************

Attachment name: [image001.jpg]
Attachment type: [image/jpeg]

4. **Class I Redesignation Guidance – Mark Sendzik (OAQPS) (10 mins.)**
   "Guidance for Indian Tribes Seeking Class 1 Redesignation of Indian Country Pursuant to Section 164(c) of the Clean Air Act" was finalized on August 29, 2013. This guidance brings together existing Agency policy on Class 1 redesignation into a single document and does not set new policy. The guidance provides: background on the PSD program, explanation of the redesignation process, key considerations for tribes in pursuing redesignation, and FAQs. The Guidance can be found at: http://www.epa.gov/air/tribal/airprogs.html#nsr.

5. **EPA Air Updates – (OAR, OAQPS, OTAQ, ORIA, OAP)**

6. **NTAA Updates – Bill Thompson, NTAA Chairman**

A. Report on the National Tribal Forum on Air Quality
B. Publication of the 2014 Status of Tribal Air Report

The next NTAA/EPA Policy call will be on
June 26th, 2014 at 12:00 Noon Mountain Time

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:23 PM
To: Thornton, Marisa
Subject: FW: Request for speaker
Attachments: removed.txt; NTAA EPA Call Agenda, May 29, 2014.docx

---

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 06, 2014 3:05 PM
To: Rosnick, Reid; Harrison, Jed
Cc: Childers, Pat; Cristina Gonzalez-Maddux; Mehrdad.Khatibi@NAU.EDU; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Subject: RE: Request for speaker

Thank you for your reply Mr. Rosnick. I am glad to hear you can be on the call.

While we are in the process of developing the agenda for the NTAA/EPA Policy call on June 26th, I have attached last month's agenda that will give you an idea of how the call proceeds.

If you can, please send me a short paragraph describing your presentation, your name, title and any web links that would be helpful background information on your presentation.

Also, if you have a PowerPoint presentation, please send that to me and I will display it during our call and will flip the slides for you.

We should be getting other topics in the next few weeks, so feel free to send me this information any time next week.

Thanks and have a great weekend!

Andy

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, June 06, 2014 3:14 AM
To: Andy Bessler; Harrison, Jed
Cc: Childers, Pat; Cristina Gonzalez-Maddux; Mehrdad - Khatibi; Perrin, Alan; Peake, Tom; Schultheisz, Daniel
Subject: RE: Request for speaker

Andy,

I would be happy to make a presentation for the NTAA/EPA policy call on June 26 at 11 am PDT. I will plan on speaking for 10-12 minutes and allow the remaining time for questions. If you would kindly send me an agenda for the call I would appreciate it.

Please feel free to contact me if you have any questions. Thanks

Reid

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Thursday, June 05, 2014 4:46 PM
To: Harrison, Jed
Cc: Rosnick, Reid; Childers, Pat; Cristina Gonzalez-Maddux; Mehrdad.Khatibi@NAU.EDU
Subject: Request for speaker

Hello Jed:

I was wondering if you could help secure a speaker for our upcoming NTAA/EPA Policy call regarding this issue linked below:

http://www.epa.gov/radiation/docs/neshaps/subpart-w/neshap_subpart-w_npr-final_-prepublication.pdf

http://tcots.epa.gov/oita/tconsultation.nsf/x/7C897AE2FCD62CF285257CB5004F585D?opendocument

I left a phone message with Mr. Rosnick and was hoping to address this issue on the upcoming call on June 26th at 11 am PT.

On our last call, this issue was raised by a concerned Tribal representative and I hope to have it addressed on our next call by having someone speak to this issue for 10-15 mintues and address any questions.

Please let me know if this might be possible.

Thanks,

Andy

Andy Bessler
Project Director
N T A A
National Tribal Air Association

P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266
www.ntaatribalair.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:27 PM
To: Thornton, Marisa
Subject: FW: NMA Presentation

From: Rosnick, Reid
Sent: Tuesday, June 03, 2014 7:07 AM
To: Peake, Tom; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: RE: NMA Presentation

Subpart W is a CAA action, and we have decided to have a hearing regardless of whether anyone asks for one. Because of that I originally wrote it like that.

From: Peake, Tom
Sent: Tuesday, June 03, 2014 7:04 AM
To: Rosnick, Reid; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: RE: NMA Presentation

Looks good through blurry eyes (possible pink eye). On page 9 change "public hearings" to "public meetings" since I don't think we are required to have hearings, unlike the CAA.

From: Rosnick, Reid
Sent: Tuesday, June 3, 2014 6:28 AM
To: Peake, Tom; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: NMA Presentation

All,

Andrea and I have looked at the presentation (attached) and made some minor changes. We still expect Phil to deliver the presentation, correct?

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:27 PM
To: Thornton, Marisa
Subject: FW: NMA Presentation

From: Peake, Tom
Sent: Tuesday, June 03, 2014 7:30 AM
To: Rosnick, Reid; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: RE: NMA Presentation

I thought I was referring to the 192 part. My apologies. I guess pink eye affects the brain, too!

From: Rosnick, Reid
Sent: Tuesday, June 3, 2014 7:06 AM
To: Peake, Tom; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: RE: NMA Presentation

Subpart W is a CAA action, and we have decided to have a hearing regardless of whether anyone asks for one. Because of that I originally wrote it like that.

From: Peake, Tom
Sent: Tuesday, June 03, 2014 7:04 AM
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Cc: Egidi, Philip; Cherepy, Andrea
Subject: RE: NMA Presentation

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To: Peake, Tom; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: NMA Presentation

All,

Andrea and I have looked at the presentation (attached) and made some minor changes. We still expect Phil to deliver the presentation, correct?

Reid

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Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:27 PM
To:	Thornton, Marisa
Subject:	FW: docket requirements

From: Rosnick, Reid
Sent: Tuesday, June 03, 2014 3:20 PM
To: Childers, Pat
Subject: RE: docket requirements

Correct. I'm taking general notes, but wanted to make sure the Tribe was aware of this. Thanks

---

From: Childers, Pat
Sent: Tuesday, June 03, 2014 3:19 PM
To: Rosnick, Reid
Subject: docket requirements

Reid

From what I understand we have to Docket who participated, the agenda, and any key concepts, or points but not extensive notes.
Hope this helps

From: Rosnick, Reid
Sent: Friday, May 30, 2014 1:15 PM
To: Childers, Pat
Subject: RE: NTC 6/4 Call - Call for Agenda Items

I can participate. I can do 5-10 minutes, but I will be limited in what I can say due to us being in the comment period. Just let me know the call in number.

From: Childers, Pat
Sent: Friday, May 30, 2014 7:50 AM
To: Rosnick, Reid
Subject: FW: NTC 6/4 Call - Call for Agenda Items

Thoughts about participating in this call. The NESHAP rule came up yesterday in the tribal policy call so there is definitely interest.

Thanks

From: Childers, Pat
Sent: Friday, May 30, 2014 7:48 AM

To: Mckelvey, Laura; Wilson, Erika; Tapia, Rosalva; Harrison, Ben; Harrison, Jed; Harrison, Jed
Subject: FW: NTC 6/4 Call - Call for Agenda Items

Mnsr or 111(d) for this call perhaps?
Tribal Dera?
NESHAP Subpart W rule?

Thoughts

From: Ingram, Paige
Sent: Thursday, May 29, 2014 4:00 PM
To: Ingram, Paige
Subject: NTC 6/4 Call - Call for Agenda Items

The NTC will have its next monthly conference call on June 4, 2-3pm EDT. The current draft agenda is below. Please let me know if you have any other items to add, or if you want to defer anything currently on the list.

Thanks,
Paige Ingram

NTC and EPA (2:00 – 3:00 pm ET)

1. Unconventional Extraction in the Oil and Gas Industry
   Lisa Biddle, Office of Water, 10 minutes
   EPA's Office of Water is developing a pretreatment standard to address wastewater generated from the unconventional oil and gas extraction industry, and would like input from the National Tribal Caucus on this effort. A summary of the rulemaking effort can be found here:
   http://water.epa.gov/scitech/wastetech/guide/oilandgas/unconv.cfm

2. Update on EPA's Hydraulic Fracturing Drinking Water study
   Lisa Matthews, Office of Research and Development, 10 minutes
   Insert any summary of or link to study

3. Next Generation Compliance
   Jonathan Binder, Office of Enforcement and Compliance Assistance, 10 minutes
   Insert any summary of or link to study

4. Logistics and Agenda Development for July 24 NTOC
   Paige Ingram, American Indian Environmental Office, 10 minutes
   - Are additional calls needed in June and July for agenda development?

5. Updates from EPA Regional and Program Offices
   EPA Tribal Program Managers

Paige Ingram
National Tribal Caucus, Regional Liaison and Climate Change
--
American Indian Environmental Office
Office of International and Tribal Affairs
U.S. Environmental Protection Agency
ingram.paige@epa.gov
202.564.9957

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:27 PM
To: Thornton, Marisa
Subject: FW: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

---

From: Palomares, Art
Sent: Tuesday, June 03, 2014 4:55 PM
To: Mitre, Alfreda; Diaz, Angelique; Reynolds, Cynthia; Jackson, Scott
Cc: O'Connor, Darcy; Sierra, Eddie; Shanahan, Mike; Morlock, Nancy; Urdiales, Aaron
Subject: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

I have communicated with Howard and Shaun regarding the government to government consultation that will take place on July 10th. While I still do not know the outcome of the conference call with HQ that occurred today on the same topic and since the consultation is about the NESHAP Subpart W and the associated/related enforcement, we think that the following folks should accompany Howard to the Ute Mountain Ute to conduct the consultation:

Alfreda Mitre, Angelique Diaz, and Cindy Reynolds (or her representative).

I'll work with Alfreda to see if we can set-up a conference call line for the rest of us, if appropriate.

Thanks!

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:26 PM
To: Thornton, Marisa
Subject: FW: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

---

From: Diaz, Angelique
Sent: Wednesday, June 04, 2014 9:02 AM
To: Palomares, Art; Mitre, Alfreda; Reynolds, Cynthia; Jackson, Scott
Cc: O'Connor, Darcy; Sierra, Eddie; Shanahan, Mike; Morlock, Nancy; Urdiales, Aaron; Patefield, Scott; Rosnick, Reid
Subject: RE: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

Yesterday's phone call with the Office of Radiation and Indoor Air (ORIA) and the Ute Mountain Ute tribe, requested by the tribe, was to discuss the approach for the July 10^{th} consultation. They have proposed 9am and are waiting for an official confirmation from us.

By the end of the week the tribe plans on submitting questions to ORIA and Region 8 that we will again discuss with the tribe by phone sometime the week of June 16^{th} or 23^{rd}. Their questions will further inform us of the specific content of the consultation a well as help us put together an agenda for that morning.

We asked them the general topics and it seems as though a lot of them relate to the Subpart W rulemaking, but as we know the Off-site Rule and Subpart W compliance at the White Mesa Mill are related to that subject. I'll let everyone know when we receive the specific questions from the Ute Mountain Ute, and will share what they are.

At the consultation, in addition to the Tribal Council, the Ute Mountain Ute plan to have in attendance the Environmental Director, a Water Quality Specialist, an Air Quality Specialist, and 2-3 attorneys. ORIA participants will be calling in and will include: Reid Rosnick (Subpart W Rulemaking workgroup chair), Mike Flynn (ORIA Director), and an OGC representative. Since they will be calling in, a line will be open and we can have additional Region 8 participants, if necessary.

Thank you,
Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Palomares, Art
Sent: Tuesday, June 03, 2014 2:55 PM
To: Mitre, Alfreda; Diaz, Angelique; Reynolds, Cynthia; Jackson, Scott

Cc: O'Connor, Darcy; Sierra, Eddie; Shanahan, Mike; Morlock, Nancy; Urdiales, Aaron
Subject: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

I have communicated with Howard and Shaun regarding the government to government consultation that will take place on July 10th. While I still do not know the outcome of the conference call with HQ that occurred today on the same topic and since the consultation is about the NESHAP Subpart W and the associated/related enforcement, we think that the following folks should accompany Howard to the Ute Mountain Ute to conduct the consultation:

Alfreda Mitre, Angelique Diaz, and Cindy Reynolds (or her representative).

I'll work with Alfreda to see if we can set-up a conference call line for the rest of us, if appropriate.

Thanks!

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:26 PM
To: Thornton, Marisa
Subject: FW: Government to Government Consultation

-----Original Message-----
From: Logan, Paul
Sent: Wednesday, June 04, 2014 9:53 AM
To: Palomares, Art
Cc: Ward, W. Robert
Subject: RE: Government to Government Consultation

Thanks Art. I'll talk with our attorneys about the issues and who might be the best person to attend for ORC. Then I'll get back to you.

Paul Logan
Deputy Regional Counsel | EPA Region 8
303.312.6854 | logan.paul@epa.gov

-----Original Message-----
From: Palomares, Art
Sent: Wednesday, June 04, 2014 7:25 AM
To: Logan, Paul; Ward, W. Robert
Cc: Palomares, Art
Subject: Government to Government Consultation

Paul,

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I would recommend that an ORC Attorney be assigned and should accompany Howard to the consultation meeting.

I can fill-in the gaps once an Attorney is assigned. Please advise. Thanks.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:25 PM
To: Thornton, Marisa
Subject: FW: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

---

From: Cantor, Howard
Sent: Wednesday, June 04, 2014 10:06 AM
To: Palomares, Art; McGrath, Shaun
Subject: Re: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

Thanks, Art.

Howard Cantor
Deputy Regional Administrator
US EPA, Region 8
Phone: (303)312-6308

From: Palomares, Art
Sent: Wednesday, June 4, 2014 7:34:00 AM
To: McGrath, Shaun; Cantor, Howard
Cc: Palomares, Art
Subject: Fw: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

Shaun and Howard,

While I was meeting with OECA, yesterday, a conference call was held with the Ute Mountain Ute Tribe and Region 8 and HQ also participated. Below is a good summary of the outcome of the conference call. I will keep you posted.

From: Diaz, Angelique
Sent: Wednesday, June 4, 2014 7:02:14 AM
To: Palomares, Art; Mitre, Alfreda; Reynolds, Cynthia; Jackson, Scott
Cc: O'Connor, Darcy; Sierra, Eddie; Shanahan, Mike; Morlock, Nancy; Urdiales, Aaron; Patefield, Scott; Rosnick, Reid
Subject: RE: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

Yesterday's phone call with the Office of Radiation and Indoor Air (ORIA) and the Ute Mountain Ute tribe, requested by the tribe, was to discuss the approach for the July 10th consultation. They have proposed 9am and are waiting for an official confirmation from us.

By the end of the week the tribe plans on submitting questions to ORIA and Region 8 that we will again discuss with the tribe by phone sometime the week of June 16th or 23rd. Their questions will further inform us of the specific content of the consultation a well as help us put together an agenda for that morning.

We asked them the general topics and it seems as though a lot of them relate to the Subpart W rulemaking, but as we know the Off-site Rule and Subpart W compliance at the White Mesa Mill are related to that subject. I'll let everyone know when we receive the specific questions from the Ute Mountain Ute, and will share what they are.

At the consultation, in addition to the Tribal Council, the Ute Mountain Ute plan to have in attendance the Environmental Director, a Water Quality Specialist, an Air Quality Specialist, and 2-3 attorneys. ORIA participants will be calling in and will include: Reid Rosnick (Subpart W Rulemaking workgroup chair), Mike Flynn (ORIA Director), and an OGC representative. Since they will be calling in, a line will be open and we can have additional Region 8 participants, if necessary.

Thank you,
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Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Palomares, Art
Sent: Tuesday, June 03, 2014 2:55 PM
To: Mitre, Alfreda; Diaz, Angelique; Reynolds, Cynthia; Jackson, Scott
Cc: O'Connor, Darcy; Sierra, Eddie; Shanahan, Mike; Morlock, Nancy; Urdiales, Aaron
Subject: Government to Government Consultation on Subpart W: July 10, 2014: White Mesa

I have communicated with Howard and Shaun regarding the government to government consultation that will take place on July 10th. While I still do not know the outcome of the conference call with HQ that occurred today on the same topic and since the consultation is about the NESHAP Subpart W and the associated/related enforcement, we think that the following folks should accompany Howard to the Ute Mountain Ute to conduct the consultation:

Alfreda Mitre, Angelique Diaz, and Cindy Reynolds (or her representative).

I'll work with Alfreda to see if we can set-up a conference call line for the rest of us, if appropriate.

Thanks!

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:25 PM
To: Thornton, Marisa
Subject: FW: Government to Government Consultation

-----Original Message-----
From: Logan, Paul
Sent: Wednesday, June 04, 2014 10:36 AM
To: Saldenha, Jasmine; Laumann, Sara
Subject: FW: Government to Government Consultation

Jasmine and Sara,

Are you aware of the consultation mentioned below? Art is recommending that an ORC attorney attend. Could you figure out the subject matter and let me know whether you'd recommend that one of you attend? For example, not sure if this will concern the CERCLA off site issues (that Jasmine is handling), or rather subpart W issues (air issues that Sara would presumably be handling), or perhaps the subset of the subpart W issues that reference the RCRA regs that Jasmine would handle, etc. Sounds like it may relate to the air rules, but I just don’t know. Also, do you know if any enforcement attorneys plan to attend? Trying to get handle on this.

Paul Logan
Deputy Regional Counsel | EPA Region 8
303.312.6854 | logan.paul@epa.gov

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Sent: Wednesday, June 04, 2014 7:53 AM
To: Palomares, Art
Cc: Ward, W. Robert
Subject: RE: Government to Government Consultation

Thanks Art. I'll talk with our attorneys about the issues and who might be the best person to attend for ORC. Then I'll get back to you.

Paul Logan
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303.312.6854 | logan.paul@epa.gov

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From: Palomares, Art
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To: Logan, Paul; Ward, W. Robert

Cc: Palomares, Art
Subject: Government to Government Consultation

Paul,

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The consultation has been scheduled for July 10 and Howard (and other Region 8 personnel) will travel to the reservation and HQ will join via telephone.

I would recommend that an ORC Attorney be assigned and should accompany Howard to the consultation meeting.

I can fill-in the gaps once an Attorney is assigned. Please advise. Thanks.

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:25 PM
To: Thornton, Marisa
Subject: FW: Government to Government Consultation

-----Original Message-----
From: Laumann, Sara
Sent: Wednesday, June 04, 2014 10:47 AM
To: Logan, Paul; Saldenha, Jasmine
Subject: RE: Government to Government Consultation

Paul

This is the first I am hearing of this consultation. I will give Art a call to see what the issues are; and also talk with him about the subpart W FOIA.

-Sara

-----Original Message-----
From: Logan, Paul
Sent: Wednesday, June 04, 2014 8:36 AM
To: Saldenha, Jasmine; Laumann, Sara
Subject: FW: Government to Government Consultation

Jasmine and Sara,

Are you aware of the consultation mentioned below? Art is recommending that an ORC attorney attend. Could you figure out the subject matter and let me know whether you'd recommend that one of you attend? For example, not sure if this will concern the CERCLA off site issues (that Jasmine is handling), or rather subpart W issues (air issues that Sara would presumably be handling), or perhaps the subset of the subpart W issues that reference the RCRA regs that Jasmine would handle, etc. Sounds like it may relate to the air rules, but I just don't know. Also, do you know if any enforcement attorneys plan to attend? Trying to get handle on this.

Paul Logan
Deputy Regional Counsel | EPA Region 8
303.312.6854 | logan.paul@epa.gov

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From: Logan, Paul
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Cc: Ward, W. Robert
Subject: RE: Government to Government Consultation

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From: Saldenha, Jasmine
Sent: Wednesday, June 04, 2014 10:55 AM
To: Logan, Paul; Laumann, Sara
Subject: RE: Government to Government Consultation

Hi Paul,

I heard that the Tribe requested the consulation but I hadn't heard about the timing of it. The consultation is in regard to CAA Subpart W, which is a CAA radon emission standard for operating uranium mill tailings. Specifically, the consultation is in regard to the proposed change to the current standard (the comment period closes on July 31).

Subpart W does not reference RCRA; it references NRC regulations. The CERCLA offsite rule references RCRA.

I may be able to attend depending on the time of the meeting (I have custody of my kids and need to get them off to summer camp that morning), but don't have to pick them up that evening.

Jasmine M. Saldenha
Associate Regional Counsel | USEPA Region 8|RC 303.312.6639| saldenha.jasmine@epa.gov

---

From: Logan, Paul
Sent: Wednesday, June 4, 2014 8:35 AM
To: Saldenha, Jasmine; Laumann, Sara
Subject: FW: Government to Government Consultation

Jasmine and Sara,

Are you aware of the consultation mentioned below? Art is recommending that an ORC attorney attend. Could you figure out the subject matter and let me know whether you'd recommend that one of you attend? For example, not sure if this will concern the CERCLA off site issues (that Jasmine is handling), or rather subpart W issues (air issues that Sara would presumably be handling), or perhaps the subset of the subpart W issues that reference the RCRA regs that Jasmine would handle, etc. Sounds like it may relate to the air rules, but I just don’t know. Also, do you know if any enforcement attorneys plan to attend? Trying to get handle on this.

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303.312.6854 | logan.paul@epa.gov

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Cc: Ward, W. Robert
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From: Logan, Paul
Sent: Wednesday, June 04, 2014 11:29 AM
To: Saldenha, Jasmine; Laumann, Sara
Subject: RE: Government to Government Consultation

Thanks Jasmine. From an earlier email, Sara is putting a call in with Art, to find out more background. So as you mention, it may be that RCRA issues really aren't a part of this, and that therefore you wouldn't need to take part. But let's see what Sara finds out.

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303.312.6854 | logan.paul@epa.gov

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Associate Regional Counsel | USEPA Region 8|RC 303.312.6639| saldenha.jasmine@epa.gov

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From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:25 PM
To: Thornton, Marisa
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

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From: Harris, Jennifer
Sent: Wednesday, June 04, 2014 12:06 PM
To: Diaz, Angelique
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

FYI. So I will generate the consultation record for the region's consultation after our meeting tomorrow. thanks

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From: Harris, Dona
Sent: Wednesday, June 04, 2014 9:39 AM
To: Harris, Jennifer
Subject: FY: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

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From: Harris.Dona@epa.gov [mailto:Harris.Dona@epa.gov] **On Behalf Of** Dona_Harris@epamail.epa.gov
Sent: Wednesday, June 04, 2014 11:24 AM
To: Tribal Notice
Subject: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Reg...

EPA's Tribal Consultation Opportunities

Consultation Title	**Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)**
EPA Lead Organization	**OAR**
Start Date	**5/8/2014**

End Date	

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The EPA contact for this List is:

Dona M Harris
American Indian Environmental Office/Office of International and Tribal Affairs

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To: Rosnick, Reid
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FYI

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Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

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Sent: Wednesday, June 04, 2014 10:06 AM
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EPA's Tribal Consultation Opportunities

Consultation Title	**Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)**
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Start Date	**5/8/2014**
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American Indian Environmental Office/Office of International and Tribal Affairs

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Subject:	FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

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From: Myers, Robert
Sent: Wednesday, June 04, 2014 12:56 PM
To: Ammon, Doug; Dailey, Anne; Anderson, RobinM; Walker, Stuart
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

FYI. There is some regional information if you click on the open consultation link

---

From: Sims, JaniceHQ
Sent: Wednesday, June 04, 2014 12:37 PM
To: Myers, Robert
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

This is the consultation for Ute Mountain Ute that I mentioned.

Janice Sims, QEP
on detail to
OSWER's Innovation Partnership and Communication Office
Tribal Program Coordinator
1200 Penn Ave, NW 5101 T
Washington, DC 20460
(202) 566-2892

From: Harris.Dona@epa.gov [mailto:Harris.Dona@epa.gov] **On Behalf Of** Dona_Harris@epamail.epa.gov
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Subject: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Reg...

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Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:24 PM
To: Thornton, Marisa
Subject: FW: TO-112 Subpart W hearings Eventbrite registration

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From: Nesky, Anthony
Sent: Thursday, June 05, 2014 4:24 PM
To: Kent, Rebecca
Subject: RE: TO-112 Subpart W hearings Eventbrite registration

Sorry for the dumb question, but the link below takes me to the main site where one purchases event tickets. Is there a longer URL I should use?

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Kent, Rebecca [mailto:Rebecca_Kent@sra.com]
Sent: Thursday, June 05, 2014 4:19 PM
To: Nesky, Anthony
Cc: Apostolico, Mary
Subject: RE: TO-112 Subpart W hearings Eventbrite registration

Tony,

Here you go, let me know if you have any issues accessing the site.

https://www.eventbrite.com/home/
Password: SRAPassword

Thanks,
Rebecca

Rebecca Kent
SRA International, Inc.
406-443-2407

From: Nesky, Anthony [mailto:Nesky.Tony@epa.gov]
Sent: Thursday, June 05, 2014 4:15 PM
To: Kent, Rebecca
Subject: RE: TO-112 Subpart W hearings Eventbrite registration

Dear Rebecca:

Sorry that I am just getting back to you, but could you please send me the link to the test registration site? I am afraid I still don't have dates, but I will review the site and we can make any other necessary changes. Thanks!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Kent, Rebecca [mailto:Rebecca_Kent@sra.com]
Sent: Wednesday, May 28, 2014 4:52 PM
To: Nesky, Anthony
Cc: Garon, Stephen; lee-Ann_Tracy@sra.com; Apostolico, Mary
Subject: TO-112 Subpart W hearings Eventbrite registration

Tony,

I made a few changes to the EventBrite website and would like you to review.

#1. I added this text "Speakers will be allotted 5 minutes to testify at the hearing. Speakers will be assigned a speaker number upon arriving, and will be called to give their testimony: Submission of written remarks is not required, but will be gladly accepted. All remarks and submissions become part of the official public record." In the following places: the main page, in the confirmation email/webpage and with the question (this was the best I could do with the formatting there are limitations to the number of characters on the question page and I had to put "dummy" checkboxes there to get all of the text included – I called EventBrite to verify this)

#2. I added "Please print and bring your ticket with you." in the confirmation email/webpage and on the main page.

#3. I moved what was in the confirmation email down to the confirmation webpage. The text in the email was formatted in HTML and that spot was for plain text only. I wasn't sure if you wanted both a confirmation email and webpage. (You can view the confirmation webpage by clicking the link in the note below the Customize order confirmation webpage section Note: HTML available. [View your current order confirmation page]

https://www.eventbrite.com/home/
Password: SRAPassword

Please take a look and let me know if there are any changes we can make or anything else that needs to be done for this registration site.

Thanks,
Rebecca

Rebecca Kent
SRA International, Inc.
406-443-2407

Thornton, Marisa

From:	Rosnick, Reid
Sent:	Tuesday, September 02, 2014 4:24 PM
To:	Thornton, Marisa
Subject:	FW: Request for speaker

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Thursday, June 05, 2014 4:46 PM
To: Harrison, Jed
Cc: Rosnick, Reid; Childers, Pat; Cristina Gonzalez-Maddux; Mehrdad.Khatibi@NAU.EDU
Subject: Request for speaker

Hello Jed:

I was wondering if you could help secure a speaker for our upcoming NTAA/EPA Policy call regarding this issue linked below:

http://www.epa.gov/radiation/docs/neshaps/subpart-w/neshap_subpart-w_npr-final_-prepublication.pdf

http://tcots.epa.gov/oita/tconsultation.nsf/x/7C897AE2FCD62CF285257CB5004F585D?opendocument

I left a phone message with Mr. Rosnick and was hoping to address this issue on the upcoming call on June 26th at 11 am PT.

On our last call, this issue was raised by a concerned Tribal representative and I hope to have it addressed on our next call by having someone speak to this issue for 10-15 mintues and address any questions.

Please let me know if this might be possible.

Thanks,

Andy

Andy Bessler
Project Director
NTAA
National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266

www.ntaatribalair.org

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:24 PM
To: Thornton, Marisa
Subject: FW: Uranium Mill Tailings Rule- Consultation with Ute Moutain - Notification Letter? Start of Consultation?

From: Harris, Dona
Sent: Thursday, June 05, 2014 5:52 PM
To: Colon, Toni
Cc: Rosnick, Reid; Harris, Jennifer; Diaz, Angelique
Subject: Uranium Mill Tailings Rule- Consultation with Ute Moutain - Notification Letter? Start of Consultation?

Toni-

I meet with R8 staff this afternoon regarding the tribal consultation that you entered yesterday. I understand that R8 is providing the on ground support for this consultation and will have staff from R8 also participate in the consultation along with HQ via teleconference.

I have made some changes based on my meeting today. The start date should be July 10 as this the date for the Ute Mountain consultation. The consultation was requested by the tribe so I added this information to the consultation record. Finally and most importantly the notification letter entered needs to be revised to reflect this specific consultation. R8 will craft and send it to Ute Mountain. A pdf copy will be entered in the notification field. Until that occurs, the notification field will remain blank. The May 8^{th} letter will be placed in the supplemental information field.

Since I also wear the EJ hat -- How are the communities being informed on their opportunity to participate? (I understand that the public meeting noted in the May 8^{th} letter is not occurring now). Are you or others in OAR working with your offices EJ coordinator?

Also what is happening with the other targeted tribes listed in the letter included in the supplemental field? Is or did OAR host a consultation with them?

I'm in tomorrow only in the morning. Also the OAR EJ coordinator is Marva King

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:28 PM
To: Thornton, Marisa
Subject: FW: NMA Presentation
Attachments: NMA 2014 4 30 14.pptx

From: Rosnick, Reid
Sent: Tuesday, June 03, 2014 6:28 AM
To: Peake, Tom; Schultheisz, Daniel
Cc: Egidi, Philip; Cherepy, Andrea
Subject: NMA Presentation

All,

Andrea and I have looked at the presentation (attached) and made some minor changes. We still expect Phil to deliver the presentation, correct?

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Thornton, Marisa

From: Rosnick, Reid
Sent: Tuesday, September 02, 2014 4:28 PM
To: Thornton, Marisa
Subject: FW: NMA Presentation

From: Rosnick, Reid
Sent: Monday, June 02, 2014 2:54 PM
To: Cherepy, Andrea
Subject: RE: NMA Presentation

Thank you!

From: Cherepy, Andrea
Sent: Monday, June 02, 2014 2:52 PM
To: Rosnick, Reid
Subject: RE: NMA Presentation

Thank you, Reid. I've reviewed the language pertaining to 192 and confirmed that it is still current. Please pass on to Phil.

Thanks,
Andrea

From: Rosnick, Reid
Sent: Monday, June 02, 2014 2:43 PM
To: Cherepy, Andrea
Subject: NMA Presentation

Hi Andrea,

I hope you had a good weekend. I have attached the NMA presentation for you to look at one more time. I had to make a change in public hearing status for Subpart W, and you may have a change or two also. Please send it back when satisfied, and I'll pass it on to Phil. Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Mr. Reid Rosnick and Tony Nesky
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460

Via email to rosnick.reid@epa.gov, nesky.tony@epa.gov

Re: Request for 120-Day Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick and Nesky,

On behalf of Uranium Watch, Eastern Navajo Dine Against Uranium Mining, Laguna Acoma Coalition for a Safe Environment, Bluewater Valley Downstream Alliance, Nuclear Information and Resource Service, Earthworks, Western Colorado Congress, Nebraska Chapter of the Sierra Club, Grand Valley Peace and Justice, Western Nebraska Resource Council, Arizona Mining Reform Coalition, the Multicultural Alliance for a Safe Environment, and Tallahassee Area Community, Inc, we urge you to extend the public comment period deadline for an additional 120 days beyond the current deadline of July 31st, 2014 for the proposed rulemaking affecting 40 CFR Part 61, subpart W.

Given the complexity of this rule, and our desire to understand its implications to communities affected by radon emissions, we believe more time is needed to formulate meaningful comments to EPA and help maximize additional public participation, which should also include hearings in affected areas.

Thanks for your consideration. If you have concerns, questions, or comments, please direct them to the following email addresses.

Sincerely,

The undersigned

Lee J Alter, Tallahassee Community, Inc
alterconsult@starband.net

Pete Dronkers, Earthworks:
pdronkers@earthworksaction.org

Susan Gordon, Multicultural Alliance for a safe Environment:
susangordon@earthlink.net

Sarah Fields, Uranium Watch:
sarah@uraniumwatch.org

Diane D'Arrigo, Nuclear Information and Resource Service:
dianed@nirs.org

Jonathan Perry, Eastern Navajo Dine Against Uranium Mining:
jonperry@yahoo.com

Jonnie Head, Bluewater Valley Downstream Alliance:
head.jonnie@gmail.com

Christine Lowery, Laguna Acoma Coalition for a Safe Environment:
ctlowery@earthlink.net

Rein Van West, Western Colorado Congress:
arcticwild@gmail.com

Buffalo Bruce, Western Nebraska Resource Council and Nebraska Chapter, Sierra Club:
buffalobruce1@gmail.com

Janet Johnson, Grand Valley Peace and Justice:
mjohnson@acsol.net

Roger Featherstone, Arizona Mining Reform Coalition:
roger@azminingreform.org

Stahle, Susan

From: Nesky, Anthony
Sent: Tuesday, June 24, 2014 2:54 PM
To: Stahle, Susan
Cc: Rosnick, Reid
Subject: FW: 40 CFR Part 61, Subpart W public comment deadline extension request
Attachments: Subpart W extension request letter.docx

FYI—we got another request for an extension. I confirmed receipt and sent him the website's message on the extension requests.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Pete Dronkers [mailto:pdronkers@earthworksaction.org]
Sent: Tuesday, June 24, 2014 11:55 AM
To: Rosnick, Reid; Nesky, Anthony
Subject: 40 CFR Part 61, Subpart W public comment deadline extension request

Dear Mr. Rosnick and Nesky,

Please find attached a letter signed by a dozen groups nationwide in support of EPA extending the public comment period for the proposed rulemaking affecting Subpart W, by 120 days.

I would appreciate your confirmation that you have received this letter.

Thank you very much,

--Pete Dronkers

=== EARTHWORKS: Protecting Communities and the Environment

Pete Dronkers
Southwest Circuit Rider
970-259-3353 x3
skype:pete.dronkers-ewa
pdronkers@earthworksaction.org
twitter: earthworksrocks
facebook/earthworksaction

USE YOUR CONSUMER POWER: SIGN THE PLEDGE TO END DIRTY GOLD MINING!
http://pledge.nodirtygold.org

Combined Federal Campaign #41290, Member of EarthShare

Stahle, Susan

From: Stahle, Susan
Sent: Tuesday, June 24, 2014 8:05 PM
To: Nesky, Anthony
Cc: Rosnick, Reid
Subject: RE: 40 CFR Part 61, Subpart W public comment deadline extension request

Thanks. Please post this letter on the subpart W website in the request for extension of public comment period section.

Susan Stahle
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
(202) 564-1272 (ph)
(202) 564-5603 (fx)

From: Nesky, Anthony
Sent: Tuesday, June 24, 2014 2:53 PM
To: Stahle, Susan
Cc: Rosnick, Reid
Subject: FW: 40 CFR Part 61, Subpart W public comment deadline extension request

FYI—we got another request for an extension. I confirmed receipt and sent him the website's message on the extension requests.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Pete Dronkers [mailto:pdronkers@earthworksaction.org]
Sent: Tuesday, June 24, 2014 11:55 AM
To: Rosnick, Reid; Nesky, Anthony
Subject: 40 CFR Part 61, Subpart W public comment deadline extension request

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I would appreciate your confirmation that you have received this letter.

Thank you very much,

--Pete Dronkers

=== EARTHWORKS: Protecting Communities and the Environment

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facebook/earthworksaction

USE YOUR CONSUMER POWER: SIGN THE PLEDGE TO END DIRTY GOLD MINING!
http://pledge.nodirtygold.org

Combined Federal Campaign #41290, Member of EarthShare

Stahle, Susan

Subject: Discussion of Questions Submitted by Ute Mountain Ute Prior to Consultation
Location: 866-299-3188, code 2023439563#

Start: Tue 6/24/2014 12:00 PM
End: Tue 6/24/2014 1:00 PM

Recurrence: (none)

Meeting Status: Accepted

Organizer: Rosnick, Reid
Required Attendees: Cherepy, Andrea; Childers, Pat; Colon, Toni; Angelique Diaz; Saldenha, Jasmine; Stahle, Susan; Schultheisz, Daniel; Peake, Tom; Patefield, Scott; Palomares, Art; Perrin, Alan; Harrison, Jed; Urdiales, Aaron; Scott, Jessica

NESHAPS Questions for UP...

Attached for your review is the set of questions received by the tribe leading up to consultation on July 10. We also hope to have a conference call with the tribe on June 26 to discuss the questions.

For this conference call, please review the questions and be prepared to discuss what expertise should be available for the call with the tribe. Thanks

Stahle, Susan

From: Scott, Jessica
Sent: Tuesday, June 17, 2014 1:48 PM
To: Stahle, Susan;Rosnick, Reid;Diaz, Angelique;Harris, Jennifer
Cc: Laumann, Sara
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Hi Sue,

That's right--as a general matter tribal consultation is not exempt from public disclosure requirements.

Thanks,

Jessica Scott
Attorney Advisor
US Environmental Protection Agency, Office of General Counsel
1200 Pennsylvania Avenue, NW
Room 7449E-2, Mailcode 2322A
Washington, D.C. 20460 (use zip code 20004 for non-USPS couriers)
202-564-3314 (phone)

-----Original Message-----
From: Stahle, Susan
Sent: Tuesday, June 17, 2014 1:37 PM
To: Rosnick, Reid; Diaz, Angelique; Harris, Jennifer
Cc: Laumann, Sara; Scott, Jessica
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

I understood from Jessica Scott, our OGC attorney who counsels on tribal matters, that conversations between EPA and a tribe during a tribal consultation are not privileged - in other words, the information is subject to public disclosure.

Thus, I believe we should include the tribal consultation request letter and any supporting information submitted with it in the docket for the proposed rule. We should also post this information on the Subpart W website.

Jessica - please correct me if I am misstating anything.

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

-----Original Message-----
From: Rosnick, Reid
Sent: Tuesday, June 17, 2014 1:30 PM
To: Diaz, Angelique; Harris, Jennifer
Cc: Stahle, Susan; Laumann, Sara
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

I do not know. I'm copying Sue Stahle and Sara Laumann for advice.

Reid

-----Original Message-----
From: Diaz, Angelique
Sent: Tuesday, June 17, 2014 1:27 PM
To: Harris, Jennifer
Cc: Rosnick, Reid
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Not sure. Do you know how HQ is handling it? I would defer to them.

Reid, do you know?

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

-----Original Message-----
From: Harris, Jennifer
Sent: Tuesday, June 17, 2014 11:25 AM
To: Diaz, Angelique
Subject: RE: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Hi, Angelique, is this consultation for public view or should be treated with privacy, which does not get published just put in the system with the documents?

-----Original Message-----
From: Diaz, Angelique
Sent: Tuesday, June 17, 2014 11:15 AM
To: Harris, Jennifer
Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Jennifer, the consultation request letter is the first attachment. There second attachment is additional information that was included.

-Angelique

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

-----Original Message-----
From: Jackson, Scott
Sent: Tuesday, May 13, 2014 7:28 AM
To: Diaz, Angelique
Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

Angelique,

Looks like this control has now bounced Art's way. I thought HQ was taking the lead? What am I forgetting?

Scott

____

Scott Jackson, Unit Chief
Indoor Air, Toxics and Transportation Unit U.S. EPA Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
(303) 312-6107

-----Original Message-----
From: Palomares, Art
Sent: Monday, May 12, 2014 4:15 PM
To: Jackson, Scott; Mitre, Alfreda; Reynolds, Cynthia
Subject: FW: AX-14-000-8386 - (Government-to-Government Consultation between EPA and the Ute Mountain Ute Tribe) - Response due on May 5, 2014 - Direct Reply for OD/DOD signature. Thank you!

The attached documents have been controlled to me for a response. Please take a look at the documents and provide me with your portion of the response by no later than May 19, 2014, to meet the controlled correspondence deadline. If you have questions, please call me at 312-6053.

Art Palomares, Director
Water Technical Enforcement Program
Office of Enforcement, Compliance
And Environmental Justice

From: Rosnick, Reid
Sent: Monday, June 16, 2014 6:07 AM
To: Stahle, Susan
Subject: FW: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218
Attachments: removed.txt; NTAA_CommentExtReq_SubpartWRule.pdf

FYI

From: Andy Bessler [mailto:Andy.Bessler@nau.edu]
Sent: Friday, June 13, 2014 4:46 PM
To: Rosnick, Reid; Group A-AND-R-DOCKET
Cc: Childers, Pat; Harrison, Jed; Mehrdad.Khatibi@NAU.EDU; ann-marie.chischilly@nau.edu; Cristina Gonzalez-Maddux; Flynn, Mike; Angela Benedict (angela.benedict@srmt-nsn.gov); bhoover@ldftribe.com (bhoover@ldftribe.com); Bill.Thompson@Penobscotnation.org; air@lldrm.org; Joseph Painter (joseph.painter@winnebagotribe.com); katerenw@nc-cherokee.com; Kellie Poolaw (kelliej@pawneenation.org); greenleaf@kootenai.org; lweeks@nemont.net; Matthew Malimanek (santeeair@gmail.com); rmccullers@pci-nsn.gov; randya@cskt.org; rkalistook@nativecouncil.org (rkalistook@nativecouncil.org); sflensburg@bbna.com (sflensburg@bbna.com); Tammy Belone (tammy.belone@jemezpueblo.org); twalea@spokanetribe.com
Subject: NTAA Request for Comment Period Extension: EPA Docket # EPA-HQ-OAR-2008-0218

Hell Mr. Rosnick:

I am pleased to forward on a letter from the NTAA Chairman, Bill Thompson regarding EPA Docket # EPA-HQ-OAR-2008-0218. This letter requesting a comment period extension is in advance of NTAA's forthcoming comments on this proposed rule.

Please confirm receipt of this letter and feel free to contact me with any clarification and/or questions regarding this request.

We look forward to response to this request.

Thank you,

Andy Bessler
Project Director

National Tribal Air Association
P.O. Box 15004
Flagstaff, AZ 86011-5004
Office: 928-523-0526
Cell: 928-380-7808
Fax: 928-523-1266

www.ntaatribalair.org

Stahle, Susan

From: Rosnick, Reid
Sent: Monday, June 16, 2014 6:15 AM
To: Stahle, Susan
Subject: FW: Initial Questions from the UMUT
Attachments: NESHAPS Questions for EPA FINAL.pdf

FYI,

Please note request for potential conference call for attorneys only.

Reid

From: Celene Hawkins [mailto:chawkins@utemountain.org]
Sent: Friday, June 13, 2014 8:11 PM
To: Rosnick, Reid; sclow@utemountain.org
Cc: clarrick@utemountain.org; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: Initial Questions from the UMUT

Dear Reid,

Attached are the initial questions from the UMUT to help the EPA and UMUT prepare for the July 10th consultation meeting. We hope that having a full discussion of these questions in the June 24-26 time period helps to make sure that we can have meaningful dialogue at the July 10th consultation meeting. Please plan accordingly when you put together your team and a time frame for the conference call (we anticipate here that it will take a few hours to get through the 28 questions).

I wanted to reiterate my offer to have a call between now and our June conference call with your EPA attorneys if there are concerns about the exchange of written materials or substantive discussion on any of the points contained in the initial questions list.

Best,

Celene Hawkins
Associate General Counsel
Ute Mountain Ute Tribe

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Friday, June 13, 2014 8:28 AM
To: Scott Clow
Cc: Colin Larrick; Celene Hawkins; Tomoe Natori; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: RE: call next week Tuesday or Wednesday?

Scott,

OK. I'll start checking for times in the 24th-26th time period.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Thursday, June 12, 2014 10:34 AM
To: Rosnick, Reid
Cc: clarrick@utemountain.org; Celene Hawkins; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Mark Smith
Subject: RE: call next week Tuesday or Wednesday?

Reid,
We are trying to get them finalized tomorrow (Friday) to send, but it may roll into Monday. Perhaps with that in mind we should scratch next Tuesday-Wednesday and aim for the 24-26th time frame. That will still give you a couple weeks before the consultation date to prepare.
SCott

From: Rosnick, Reid [mailto:Rosnick.Reid@epa.gov]
Sent: Thursday, June 12, 2014 4:20 AM
To: Scott Clow
Cc: Colin Larrick; Tomoe Natori; Michael King; 'mKeller@vancott.com'; Celene Hawkins; Mitre, Alfreda; Stahle, Susan; Peake, Tom; Childers, Pat; Harrison, Jed
Subject: RE: call next week Tuesday or Wednesday?

Hi Scott,

We would like to have the conference call with you as soon as practicable. However, we would like to have your questions in hand so we can discuss them with you during the call. Can you give me a better idea of when you will be able to transmit your questions? I would like at least a day or two to get them to EPA participants so we can discuss your concerns more effectively. Thanks.

I'll be away from my desk all day, in training, but I will check my email and voice mail at the end of the day. Thanks again.

Reid

From: Scott Clow [mailto:sclow@utemountain.org]
Sent: Wednesday, June 11, 2014 6:31 PM
To: Rosnick, Reid
Cc: clarrick@utemountain.org; tnatori@utemountain.org; Michael King; 'mKeller@vancott.com'; Celene Hawkins; Mitre, Alfreda
Subject: call next week Tuesday or Wednesday?

HI Reid,
We are working on preparing the questions that we will want answers for at the upcoming consultation meeting. We are planning to have those to your team at EPA in the next few days.
We would like to schedule our second pre-consultation call to clarify the questions. We have availability next Tuesday (I can skip out of a little of my ROC meeting if necessary) or Wednesday afternoon. I think we could bump it into the following week, 24-26th but I will need to confirm that with our team. Please consider some dates.
Thanks,
Scott

Stahle, Susan

From: Nesky, Anthony
Sent: Monday, June 16, 2014 3:01 PM
To: Stahle, Susan;Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: Draft Subpart W webpage and attachments
Attachments: Memo-to-Docket-requesting-hearing-6-10-14.pdf; NTAA_CommentExtReq_SubpartWRule.pdf; rulemaking-activity.html; UraniumWatchExtensionRequest6-12-14.pdf; UraniumWatchHearingRequest-6-10-14.pdf; DraftSubpartWpage-6-16-14.pdf

Importance: High

Dear Sue and Reid:

Attached is a PDF file of a draft update the Subpart W webpage. The page uses the language that you sent me. (I'm afraid we don't have access to the staging server today, so I can only show you a PDF file of the page hosted on our local drive. The format problems will resolve upon upload to the server.)

Please review the draft webpage, provide me with any changes, and approve to publish.

I am also attaching the PDF files that will be added to the site. I would appreciate your checking the Memo to Docket.

Thanks very much for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Stahle, Susan

From: Stahle, Susan
Sent: Monday, June 16, 2014 4:23 PM
To: Nesky, Anthony;Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: RE: Draft Subpart W webpage and attachments

Hi Tony –

Thanks for the phone calls (aka the nudging to look at my email).

The webpage looks great. Please go ahead and publish and make this available to the public.

The memo to the docket also looks good.

Thanks!

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

From: Nesky, Anthony
Sent: Monday, June 16, 2014 3:01 PM
To: Stahle, Susan; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: Draft Subpart W webpage and attachments
Importance: High

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Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597

nesky.tony@epa.gov

Stahle, Susan

From: Nesky, Anthony
Sent: Monday, June 16, 2014 4:24 PM
To: Stahle, Susan
Subject: RE: Draft Subpart W webpage and attachments

Thank you for your input! Have a nice evening.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Stahle, Susan
Sent: Monday, June 16, 2014 4:23 PM
To: Nesky, Anthony; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: RE: Draft Subpart W webpage and attachments

Hi Tony –

Thanks for the phone calls (aka the nudging to look at my email).

The webpage looks great. Please go ahead and publish and make this available to the public.

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Thanks!

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

From: Nesky, Anthony
Sent: Monday, June 16, 2014 3:01 PM
To: Stahle, Susan; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: Draft Subpart W webpage and attachments
Importance: High

Dear Sue and Reid:

Attached is a PDF file of a draft update the Subpart W webpage. The page uses the language that you sent me. (I'm afraid we don't have access to the staging server today, so I can only show you a PDF file of the page hosted on our local drive. The format problems will resolve upon upload to the server.)

Please review the draft webpage, provide me with any changes, and approve to publish.

I am also attaching the PDF files that will be added to the site. I would appreciate your checking the Memo to Docket.

Thanks very much for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Stahle, Susan

From: Nesky, Anthony
Sent: Monday, June 16, 2014 6:16 PM
To: Stahle, Susan;Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: RE: Draft Subpart W webpage and attachments

The page is updated:

http://www.epa.gov/radiation/neshaps/subpartw/rulemaking-activity.html

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: Stahle, Susan
Sent: Monday, June 16, 2014 4:23 PM
To: Nesky, Anthony; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: RE: Draft Subpart W webpage and attachments

Hi Tony –

Thanks for the phone calls (aka the nudging to look at my email).

The webpage looks great. Please go ahead and publish and make this available to the public.

The memo to the docket also looks good.

Thanks!

Susan Stahle
Attorney-Advisor
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
202-564-1272 (ph)
202-564-5603 (fax)
stahle.susan@epa.gov

From: Nesky, Anthony
Sent: Monday, June 16, 2014 3:01 PM
To: Stahle, Susan; Rosnick, Reid
Cc: Herrenbruck, Glenna
Subject: Draft Subpart W webpage and attachments
Importance: High

Dear Sue and Reid:

Attached is a PDF file of a draft update the Subpart W webpage. The page uses the language that you sent me. (I'm afraid we don't have access to the staging server today, so I can only show you a PDF file of the page hosted on our local drive. The format problems will resolve upon upload to the server.)

Please review the draft webpage, provide me with any changes, and approve to publish.

I am also attaching the PDF files that will be added to the site. I would appreciate your checking the Memo to Docket.

Thanks very much for your help!

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Stahle, Susan

From: Rosnick, Reid
Sent: Friday, June 13, 2014 6:12 AM
To: Stahle, Susan
Subject: FW: Subpart W Rulemaking Documents

FYI

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Thursday, June 12, 2014 1:25 PM
To: Rosnick, Reid
Cc: Group A-AND-R-DOCKET
Subject: Subpart W Rulemaking Documents

Dear Mr. Rosnick,

The following have become apparent:

1. The EPA did not receive a Clean Air Act (CAA) Section 114 response from Uranium One about the Shootaring Canyon Mill, and maybe did not even request such information. If the EPA had received such information, the EPA would not have made a false and misleading statement about the nature of the Shootaring Canyon tailings impoundment liner in the Subpart W Rulemaking May 2, 2014, *Federal Register* Notice (79 Fed. Reg. 25388).

2. The EPA never received a response from Denison Mines (USA) Corp. to the May 2009 CAA Section 114 letter requesting information about the evaporation ponds at the White Mesa Mill. This is apparent by the lack of information about the evaporation ponds at the White Mesa Mill in the “Risk Assessment Revision for 40 CFR Part 61 Subpart W – Radon Emissions from Operating Mill Tailings; Task 5 – Radon Emission from Evaporation Ponds,” by S. Cohen & Associates, November 9, 2010. The evaluation of Radon Emissions from Evaporation Ponds does not reference any Denison Mines communication and does not discuss the White Mesa Mill evaporation ponds. Clearly the EPA contractor did not have the pertinent information before them regarding the White Mesa Mill evaporation ponds.

3. The EPA must request, receive, and post the same information about the Shootaring Canyon Mill that was received for other uranium mills. The EPA must again request that the licensee, now Energy Fuels Resources Inc., provide information about the impoundments at the White Mesa Mill that store processing liquids. This would include Cells 1 and 4B, Robert’s Pond, and the fluids on top of Cells 3 and 4A. This would include data on the radium and other radiological contents of the fluids in these impoundments over time.

4. The EPA must extend the comment period to provide an opportunity for the EPA to obtain this relevant information, make it publicly available, and allow for public review.

5. The EPA should seriously consider withdrawing the May 2, 2014, *Federal Register* Notice, because the the proposed rule, as it applies to conventional uranium mill tailings impoundments, is based, in a significant part, on the incorrect and unsubstantiated claim that the Shootaring Canyon tailings impoundment has a synthetic liner. Therefore, the proposed rule lacks a significant factual basis.

Sincerely,

Sarah Fields
Program Director

Uranium Watch
PO Box 34
Moab, Utah 84532
435-260-8384

Stahle, Susan

From: sarah@uraniumwatch.org
Sent: Friday, June 13, 2014 3:05 PM
To: Rosnick, Reid
Cc: Stahle, Susan;Peake, Tom;Schultheisz, Daniel
Subject: RE: Comments to Docket

Dear Mr. Rosnick,

Thank you. I hope that the EPA will address the issue of missing CAA Section 114 Question and Response records for White Mesa, Shootaring Canyon, and Sweetwater Mills at this time.

Also, request for extension of time and hearing.

Sarah

> -------- Original Message --------
> Subject: Comments to Docket
> From: "Rosnick, Reid" <Rosnick.Reid@epa.gov>
> Date: Fri, June 13, 2014 12:45 pm
> To: "sarah@uraniumwatch.org" <sarah@uraniumwatch.org>
> Cc: "Stahle, Susan" <Stahle.Susan@epa.gov>, "Peake, Tom" <Peake.Tom@epa.gov>, "Schultheisz, Daniel" <Schultheisz.Daniel@epa.gov>
>
> Hello Sarah,
>
> I hope you are well. I wanted to let you know that I have received your emails concerning the Subpart W issues you have raised. Looking at the emails, I believe that these are comments from you specific to the Subpart W proposed rulemaking, and as such they belong in the dedicated Subpart W docket. Please submit your comments, identified by Docket ID No**. EPA-HQ-OAR-2008-0218**, to www.regulations.gov: Follow the on-line instructions for submitting comments. For additional information about EPA's public docket visit the EPA Docket Center homepage at http://www.epa.gov/epahome/dockets.htm. Thanks.
>
> Reid
>
> ______________________________
> Reid J. Rosnick
> US Environmental Protection Agency
> Radiation Protection Division
> 202.343.9563
> rosnick.reid@epa.gov

Stahle, Susan

From: Rosnick, Reid
Sent: Thursday, June 12, 2014 6:47 AM
To: Stahle, Susan
Subject: FW: Other Documents Missing from EPA Subpart W Rulemaking Website

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From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Wednesday, June 11, 2014 4:42 PM
To: Rosnick, Reid
Cc: Group A-AND-R-DOCKET
Subject: Other Documents Missing from EPA Subpart W Rulemaking Website

Dear Mr. Rosnick,

In addition to the missing Shootaring Canyon Clean Air Act (CAA) Section 114 documents, there are some White Mesa Mill documents that are missing from the list of Section 114 Letters/Responses on the EPA Subpart W Rulemaking website and the Rulemaking Docket at the federal rulemaking website.

1. The Denison Mines June 1, 2009, response to the February, 24, 2009, EPA CAA Section 114 request for White Mesa Mill information refers to attachments to their response. However, those attachments, which include the radon-flux test results since 1992 and a Reclamation Plan, were not posted to the Subpart W Rulemaking website.

2. The EPA sent Denison Mines a May 5, 2009, request for information regarding the radon emissions from the
White Mesa Mill evaporation pond(s). The response to that inquiry, if received, is not available to the public on the EPA Subpart W website. That response should be posted, or a note made that no response was
received. If no response was received, the EPA must ask again for that data.

3. Information regarding the emissions from the White Mesa Mill provided to the EPA in 2009 do not, of course, include the most recent Annual Subpart W Reports. The reports since 2008/2009 are relevant to the Subpart W rulemaking, particularly the reports starting with the 2012 Annual Subpart W Compliance Report. The 2012 Annual Report showed that radon flux for Cell 2 exceeded the Section 61.252(a) standard. The licensee commenced monthly reporting, as required by Section 61.254(b). The White Mesa Annual 2012 and 2013 reports and the monthly 2013-2014 reports are very relevant to the current rulemaking. These reports were submitted to the EPA Region 8, in addition to the Utah Division of Air Quality, so they are readily available to the EPA. White Mesa Mill Subpart W annual and monthly radon flux compliance reports since 2008 should be made part of the record of the Subpart W Rulemaking.

4. It is likely that attachments to other Section 114 responses have not been posted.

Please post the above referenced documents on the EPA Subpart W website and the Rulemaking Docket.

Thank you,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84532

Stahle, Susan

From: Rosnick, Reid
Sent: Thursday, June 12, 2014 9:07 AM
To: Stahle, Susan
Subject: FW: Another Question re EPA Subpart W Rulemaking

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Sunday, June 08, 2014 12:40 PM
To: Rosnick, Reid
Subject: Another Question re EPA Subpart W Rulemaking

Dear Reid,

Can you explain why the Subpart W Rulemaking Activity Webpage list of EPA requests for information from uranium recovery facilities and licensee responses (Section 114 Letters/Responses) does not include a request to Uranium One Inc. and Uranium One's response for the Shootaring Canyon Mill?

Did the EPA send a request for information? Did Uranium One respond?

Thank you,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84532

Stahle, Susan

From: Rosnick, Reid
Sent: Thursday, June 12, 2014 9:07 AM
To: Stahle, Susan
Subject: FW: Documents on Subpart W Gov. Rulemaking Docket

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Sunday, June 08, 2014 5:08 PM
To: Rosnick, Reid
Subject: Documents on Subpart W Gov. Rulemaking Docket

Dear Reid,

The document, "Surface Water Hydrology Considerations in predicting radon releases from water-covered areas of uranium tailings ponds." does not appear to have been posted on the government rulemaking docket for
the Subpart W rulemaking. The PDF file is supposed to be there when linking to the following, but is not:

http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2008-0218-0002

Thank you,

Sarah Fields
Uranium Watch

Stahle, Susan

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 1:20 PM
To: Stahle, Susan
Cc: Rosnick, Reid;Herrenbruck, Glenna
Subject: Planned hearings for Subpart W rulemaking: draft memo to Docket and draft text for website
Attachments: Memo to Docket requesting hearing.docx; draft-website-text-on-hearing-plans.docx

Dear Sue:

Per our discussion yesterday, I have drafted a memo to the Docket to document INFORM Colorado's request for a public hearing for the Subpart W rulemaking. I have also drafted text to be put on the Subpart W website to inform the public that hearings have been requested, and that we are planning them. Please take a look at the attached files and provide your feedback. It would be nice to post the information to the website on Monday.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

Stahle, Susan

From: Nesky, Anthony
Sent: Thursday, June 12, 2014 4:55 PM
To: Stahle, Susan
Cc: Rosnick, Reid
Subject: FW: Amended Hearing Request and Request for Records

See the below email from Uranium Watch.

Tony Nesky
Center for Radiation Information and Outreach
Tel: 202-343-9597
nesky.tony@epa.gov

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Thursday, June 12, 2014 3:52 PM
To: Rosnick, Reid
Cc: Nesky, Anthony; Group A-AND-R-DOCKET
Subject: Amended Hearing Request and Request for Records

Dear Mr. Rosnick,

This is to amend my request for extension of time for the public to submit comments on the 40 CFR Part 16 Subpart W Rulemaking. I request a 120-day extension of time.

I have also realized that there are no Section 114 Letters/Responses for facility information for the Kennecott Sweetwater Mill. If the EPA is going to make assertions regarding the Sweetwater Mill, the documentation to support those assertions must be available to the public on the Rulemaking Docket and EPA Subpart W webpage.

Also, the EPA Background Information Document and the Risk Assessments refer to various other documents. However, there is scant information regarding public access to these records, and the EPA has not posted these documents to the EPA Subpart W Website.

A 120-day extension of time to submit comments will give the EPA time to request pertinent information from Uranium One, Energy Fuels, and Kennecott and make those responses and the documents referenced in the BID and Rick Assessments available to the public and for the public to review the documents in order to frame comments.

Thank you for your consideration of this request,

Sarah Fields
Program Director
Uranium Watch
PO Box 344
Moab, Utah 84533
435-260-8384

Uranium Watch

76 South Main Street, # 7 | P.O. Box 344
Moab, Utah 84532
435-260-8384

June 10, 2014

via electronic mail

Mr. Reid Rosnick
Radiation Protection Division
U.S. Environmental Protection Agency
Headquarters
Ariel Rios Building
Mail Code: 6608J
1200 Pennsylvania Avenue, N. W.
Washington, D.C. 20460
rosnick.reid@epa.gov

Re: Request for Extension of Comment Period and Request for Hearing: Docket ID No. EPA–HQ– OAR–2008–0218. Comments on Proposed Rule: Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings (40 C.F.R. Part 61 Subpart W). 79 Fed. Reg. 25388, May 2, 2014.

Dear Mr. Rosnick:

REQUEST FOR EXTENSION OF TIME TO SUBMIT COMMENTS

Uranium Watch requests a 60-day extension of the time period to submit comments on the Environmental Protection Agency's (EPA's) Proposed Revisions to National Emission Standards for Radon Emissions From Operating Mill Tailings, 49 C.F.R. Part 61 Subpart W, Docket ID No. EPA–HQ– OAR–2008–0218. 79 Fed. Reg. 25388, May 2, 2014.

The request for a 60-day extension of time is based on the following.

Proposed Subpart W Factual Bases: One of the EPA's primary reasons for the proposed elimination of the requirement for radon monitoring and reporting at "existing" mill tailings impoundments (as defined in 40 C.F.R. § 61.251(d)) is the claim that the existing tailings impoundment at the Shootaring Canyon Mill (Garfield County, Utah) has a "synthetic liner." This claim is not supported by a citation in the proposed rule or

documentation in the Rulemaking Docket. The fact is that the tailings impoundment for the Shootaring Canyon Mill has a clay liner, not a synthetic liner.[1] This reality means that the EPA has a very shaky factual basis for its determination that, soon, any "existing" conventional tailings impoundments will all meet the standard in 10 C.F.R. § 61.252(b)(1), and, therefore, it is appropriate to eliminate any requirement for radon monitoring at "existing" tailings impoundments.

This incorrect factual claim regarding the Shootaring Canyon Mill and other misinformation, misleading information, incomplete information, and outdated information require a commenter to carefully review the proposed rule and supporting documents. Also, the EPA has asked for commenters' thoughts on various aspects of the proposed rule. These lengthy and detailed research and comment preparations require additional time in order to frame informed comments.

REQUEST FOR HEARING

I would also request a hearing on Subpart W rulemaking at White Mesa, San Juan County. I will be out of state from mid-June until the week of July 27, so request a hearing at White Mesa after July 27, 2014. Therefore, additional time for comments and hearings are necessary.

Thank you for consideration of this request.

Sincerely,

Sarah Fields
sarah@uraniumwatch.org

[1] http://www.radiationcontrol.utah.gov/Uranium_Mills/uraniumone/docs/2012/March/DRC-2012-001447.pdf

Stahle, Susan

From: Rosnick, Reid
Sent: Wednesday, June 11, 2014 6:36 AM
To: Stahle, Susan
Cc: Edwards, Jonathan;Peake, Tom;Schultheisz, Daniel;Herrenbruck, Glenna;Nesky, Anthony
Subject: FW: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing
Attachments: HearingRequest.140610.pdf

Importance: High

Hi Sue,

FYI. Sarah is requesting a 60 day extension and a request that a hearing take place in White Mesa, UT. Considering that we are already extending the comment period, please advise on next steps . Thanks.

From: sarah@uraniumwatch.org [mailto:sarah@uraniumwatch.org]
Sent: Tuesday, June 10, 2014 3:44 PM
To: Rosnick, Reid
Subject: EPA Subpart W Rulemaking_Request for Extension of Time and Hearing

Dear Mr. Rosnick,

Attached is a request for extension of time to submit comments on the EPA 40 C.F.R.Part 61 Subpart W Rulemaking and a request for hearing.

Thank you,

Sarah Fields
PO Box 344
Moab, Utah 84532
435-260-8384

Stahle, Susan

From:	Blake, Wendy
Sent:	Wednesday, June 04, 2014 8:03 AM
To:	Stahle, Susan
Subject:	RE: Ute Mt Ute Consultation

Sue - I think we should have someone cover the July 10 meeting. Please keep me in the loop once we get the questions from the tribe. Do we have any sense of when we will receive the questions? Lets plan to meet to discuss the questions once you and the program have had a chance to review them.

Wendy

From: Stahle, Susan
Sent: Tuesday, June 3, 2014 5:12 PM
To: Blake, Wendy
Subject: FW: Ute Mt Ute Consultation

FYI - This is for the Subpart W proposed rule. I told Reid that I can cover the next phone call but I am out on vacation July 3-14 so I cannot participate in the consultation. Is this something you would like to participate in?

Susan Stahle
Air and Radiation Law Office
Office of General Counsel
U.S. Environmental Protection Agency
(202) 564-1272 (ph)
(202) 564-5603 (fx)

From: Rosnick, Reid
Sent: Tuesday, June 3, 2014 4:59 PM
To: Stahle, Susan
Cc: Peake, Tom; Schultheisz, Daniel; Perrin, Alan; Edwards, Jonathan
Subject: Ute Mt Ute Consultation

HI Sue,

I had a conference call with the tribe today to firm up the process for the July 10, 2014 consultation (notes attached). We will be having another call in a week or two to have further discussions. I would like to invite you to the next call and the consultation (invitations forthcoming) so that we make sure that we have legal coverage on both issues. Please feel free to call me tomorrow and we can discuss. Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov

Stahle, Susan

From: Rosnick, Reid
Sent: Wednesday, June 04, 2014 12:21 PM
To: Stahle, Susan
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

Sue,

FYI. This is on the AIEO website, I believe.

From: Diaz, Angelique
Sent: Wednesday, June 04, 2014 12:10 PM
To: Rosnick, Reid
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

FYI

Angelique D. Diaz, Ph.D.
Environmental Engineer
Air Program, USEPA/Region 8
1595 Wynkoop Street (8P-AR)
Denver, CO 80202-1129
Office: 303.312.6344
Fax: 303.312.6064
diaz.angelique@epa.gov

From: Harris, Jennifer
Sent: Wednesday, June 04, 2014 10:06 AM
To: Diaz, Angelique
Subject: FW: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

FYI. So I will generate the consultation record for the region's consultation after our meeting tomorrow. thanks

---

From: Harris, Dona
Sent: Wednesday, June 04, 2014 9:39 AM
To: Harris, Jennifer
Subject: FY: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Re

From: Harris.Dona@epa.gov [mailto:Harris.Dona@epa.gov] **On Behalf Of** Dona_Harris@epamail.epa.gov
Sent: Wednesday, June 04, 2014 11:24 AM
To: Tribal Notice
Subject: [epa_tcots] Courtesy Notice - Tribal Consultation Opportunity Announcement - Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W) (Reg...

EPA's Tribal Consultation Opportunities

Consultation Title	**Ute Mountain Ute: Notification of Consultation on National Emission Standards for Hazardous Air Pollutants - Operating Uranium Mill Tailings Piles (40 CFR 61, Subpart W)**
EPA Lead Organization	**OAR**
Start Date	**5/8/2014**
End Date	

This is a courtesy announcement that the USEPA intends to consult with tribal governments on the above mentioned action. This announcement is being sent both to tribal governments' representatives and other organizations such as EPA's tribal partnership groups that may also be interested in this action.

Official notification of consultation will be sent to tribal governments potentially affected by this action. To obtain additional information about this action and other EPA consultations on going or planned **Click here to open Tribal Portal**

Direct weblink for this consultation ==> **Click here to open consultation**

The EPA contact for this List is:

Dona M Harris
American Indian Environmental Office/Office of International and Tribal Affairs

Memo to: Docket EPA-HQ-OAR-2008-0218

Subject: 6-3-14 meeting with Ute Mountain Ute Tribe to discuss preparations for the July 10, 2014 consultation between EPA and the Tribe on EPA's current proposed regulation at 40 CFR 61

From: Reid J Rosnick, Radiation Protection Division

Members of EPA: Reid Rosnick, Andrea Cherepy, Pat Childers, Jed Harrison, Angelique Diaz, Scott Patefield, Scott Jackson, Randy Brown

Ute Mt. Ute Tribe representatives: Scott Clow, Celine Hawkins, Colin Larrick, Mike Keller, Tomoe Natori

Scott Clow noted that the consultation is scheduled for July 10, 2014 beginning at approximately 9 am, MDT. EPA noted that members of Region 8 will attend while members of ORIA will call in. The consultation will be entirely about the proposed Subpart W rulemaking. If any time remains, we could discuss the off-site or alternate fees issues.

Scott and Celine discussed the process leading up to the consultation: The Tribe will be sending EPA quite a few questions regarding the proposed rule. Examples include E.O. 13175, specific analyses of the White Mesa facility, development of the concept and definitions for non conventional impoundments and conventional impoundments. They would also like to discuss the references to the 40 CFR 192 proposal and how this fits in with Subpart W. There are many questions that will be sent to EPA in the next week. We will then schedule another conference call on either the week of June 16 or June 24 to discuss the questions so that we are prepared for the consultation.

The meeting was then adjourned.

Stahle, Susan

From: Rosnick, Reid
Sent: Tuesday, June 03, 2014 4:59 PM
To: Stahle, Susan
Cc: Peake, Tom;Schultheisz, Daniel;Perrin, Alan;Edwards, Jonathan
Subject: Ute Mt Ute Consultation
Attachments: Summary of 6_3_14 meeting with Ute Mt. Ute to discuss consultation.docx

HI Sue,

I had a conference call with the tribe today to firm up the process for the July 10, 2014 consultation (notes attached). We will be having another call in a week or two to have further discussions. I would like to invite you to the next call and the consultation (invitations forthcoming) so that we make sure that we have legal coverage on both issues. Please feel free to call me tomorrow and we can discuss. Thanks

Reid

____

Reid J. Rosnick
US Environmental Protection Agency
Radiation Protection Division
202.343.9563
rosnick.reid@epa.gov