Cleaning Up Abandoned Uranium Mines on the Navajo Nation

New Funding Fuels Assessment, Cleanup

The lands of the Navajo Nation include 27,000 square miles spread over three states in the Four Corners area. The unique geology of these lands makes them rich in uranium, a radioactive ore in high demand after the development of atomic power and weapons at the close of World War II in the 1940s.

From 1944 to 1986, nearly 30 million tons of uranium ore were extracted from Navajo lands under leases with the Navajo Nation. Today the mines are closed, but a legacy of uranium contamination remains, including over 500 abandoned uranium mines (AUMs) as well as homes and drinking water sources with elevated levels of radiation.

On January 23, 2015 a historic settlement was reached with Anadarko Petroleum Corporation and Kerr-McGee Corporation in a lawsuit brought by the U.S. Department of Justice. The settlement followed a determination by the U.S. Bankruptcy Court that Kerr-McGee had fraudulently conveyed billions of dollars in assets to a subsidiary of Anadarko Petroleum named Tronox Limited, in an attempt to avoid environmental liabilities.

The Tronox settlement provides substantial funding for environmental cleanup and for environmental claims throughout the United States, including almost $1 billion to USEPA's Superfund Division to clean up 50 abandoned uranium mines located on or impacting Navajo Nation lands.

Although the legacy of uranium mining is widespread and will take many years to address completely, the collaborative effort of USEPA, other federal agencies and the Navajo Nation will bring an unprecedented level of support and protection for the people at risk from these sites.

Much work remains to be done, and this update is designed to provide some insight for our readers into interesting and timely developments as we undertake the cleanup.

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Photo taken from **http://serc.carleton.edu/research_education/nativelands/index.html.**
(Doug Brugge/Memories Come To Us In the Rain and the Wind. Photograph by Milton "Jack" Snow.)

Tronox Mines: A Bird's Eye Assessment

The Environmental Protection Agency's (EPA) Airborne Spectral Photometric Environmental Collection Technology (ASPECT) aircraft, based in Dallas, TX was first put into EPA service in 2001 as a result of the September 11 terrorist attacks, which tragically taught us that real-time aerial data was critical in emergency response situations. Today, ASPECT "… is the only one of its kind in the world and is capable of delivering actionable intelligence to decision-makers any-

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where in the world in less than five minutes," says Dr. Mark Thomas, ASPECT Program Manager.

Abandoned uranium mines on the Navajo Nation have impacted people and property. The problems posed are not completely defined, so in November 2014, when EPA's On-Scene Coordinator Randy Nattis was tasked with developing a plan for mapping the nature and extent of radiation within the area covered by the Tronox decision, he turned to ASPECT.

"I knew that in the 1990's, DOE [U.S. Department of Energy] had flown a helicopter with similar technology over the area, and that EPA had flown an ASPECT mission over the Grants Mineral Belt in New Mexico. The technology was proven, so we wanted to use it for our work," said Nattis. "It made sense to fly ASPECT over these areas. We wanted to paint the picture and help us prioritize resources and create a target list for the years to come. This is the first step in a long process."

Although ASPECT possesses a wealth of disaster response tools, most relevant is its ability to take geo-referenced aerial and oblique photographs, coupled with matching radiological information, using on-board gamma-ray spectrometer systems and high-resolution digital cameras.

The EPA ASPECT aircraft flew over 180 square miles.

When Randy requested to use ASPECT for 32 mines in the Cove Chapter area, it made perfect sense to John Cardarelli, the ASPECT team's Certified Health Physicist and radiological lead. "This is what our aircraft was designed for," said Cardarelli. "ASPECT is the most sensitive and calibrated radiation detection system in the country that employs advanced algorithms based on EPA, International Atomic Energy Agency and DOE methods. It is the ideal tool to characterize large areas for potential radiological contamination at or near background concentrations."

The ASPECT flew the team's first flight in December 2014. Wilson Yee, the EPA's field team lead on board, coordinated with Nattis, ASPECT, Navajo Nation agencies, and local communities.

"It made sense to fly ASPECT over these areas. We wanted to paint the picture and help us prioritize resources and create a target list for the years to come. This is the first step in a long process."

- Randy Nattis

"Given the potential concerns with low-flying aircraft near homes and communities, it was critical to get the word out to affected areas. We distributed fact sheets, set up radio announcements, and worked with Navajo Nation EPA to talk to community members at chapter meetings in advance of the field work," said Yee.

The ASPECT scans covered an area encompassing seven Navajo Nation chapters: Cove, Teec Nos Pos, Sweetwater, Red Valley, Round Rock, Lukachukai, and Red Mesa. During the scans, Yee was on site to answer questions from community members and to assist with daily scanning activities. Because of extensive outreach efforts and the opportunity for communities to get answers to their questions, few concerns were conveyed to EPA.

Preliminary results from the December survey helped EPA and Navajo Nation EPA strengthen characterization efforts. These measurements were used to develop site-specific calibration factors for ASPECT and provide actual concentrations for uranium found in the surface soils. The ASPECT team reached out to EPA's Radiological Emergency Response Team to provide this ground-based measurement capability. Christopher Royce and Scott Faller from the National Analytical Radiation Environmental Laboratories (NAREL) joined the ASPECT team in May to conduct measurements. This effort, led by Nattis, wrapped up the ground-based measurements, airborne gamma scans, and aerial photography of the area, encompassing 26 target mines.

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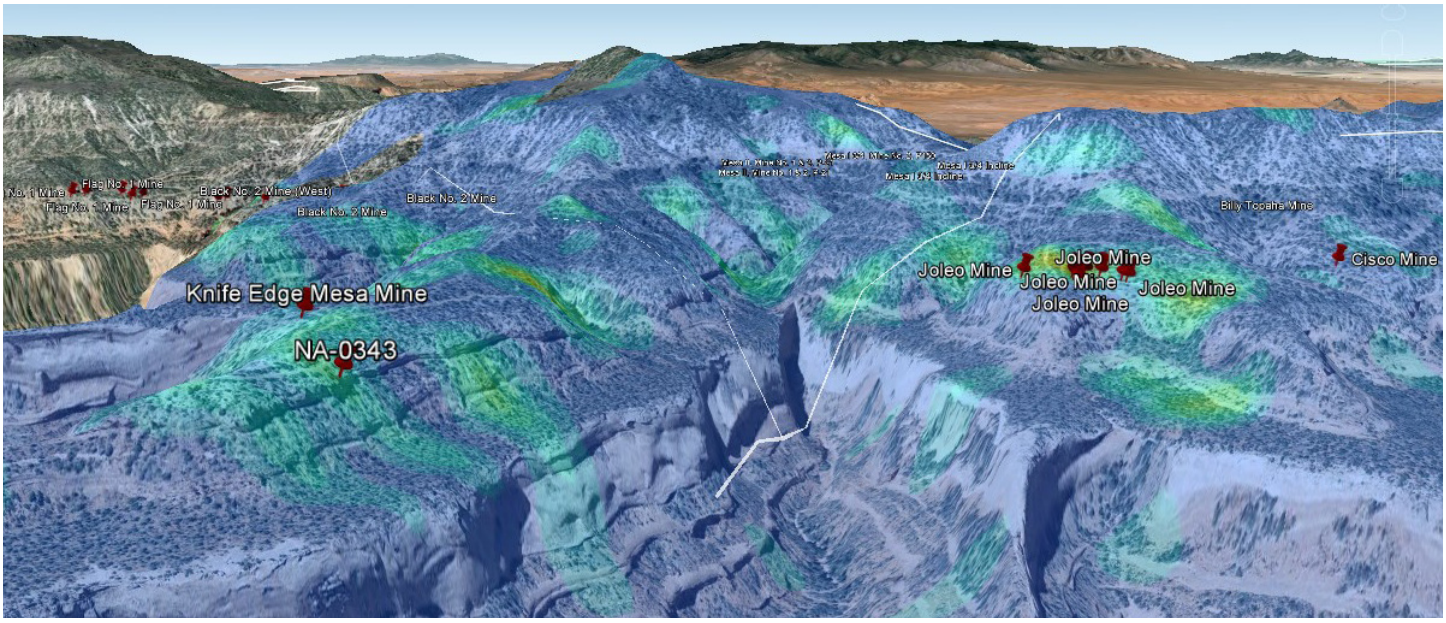

Preliminary image of ASPECT radiological readings over one of the areas where Tronox mines are located. Foreground areas shown in green and yellow indicate elevated levels of radiation.

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"Other than the large size of the area in question, the rough terrain is what necessitated the use of ASPECT," said Nattis. "It would be difficult, at best, and nearly impossible to reach the locations we needed to evaluate if we were on land, even in an all-terrain vehicle. It was even tough to get to locations where we took our *in-situ* calibration readings."

"During public meetings," Yee added, "community members, including a few elders, remembered the DOE flyovers in the 1990s, and suggested the use of helicopters. They were spot-on, as we are considering these as a means to obtain scans of very difficult to reach areas in future phases."

The draft ASPECT report is complete. ASPECT's radiological readings measure surface-soil uranium concentrations to approximately a one-foot depth, which will result in maps shaded in blues and reds, with blue indicating low-to no-excess uranium concentrations and red indicating areas of higher uranium concentrations. ASPECT helps rapidly eliminate background or low level areas from consideration, and allows resources to be focused on areas that have higher readings.

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