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# Permit Analysis

## Synthetic Minor Source Permit

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## Granite Construction Company
## Hot Mix Asphalt Plant

Colville Reservation
Okanogan, Washington

### Purpose of Permit and Permit Analysis

Title 40 of the Code of Federal Regulations 49.158 establishes a permitting program to provide for the establishment of requirements that are Federally-enforceable and enforceable as a practical matter for air pollution sources located within Indian country. The owner or operator of an air pollution source can voluntarily request a federally- and practicably-enforceable limitation on the source's actual emissions or potential to emit to avoid exceeding the major source permitting thresholds under the Clean Air Act.

This document, the Permit Analysis document, fulfils the requirement of 40 CFR 49.157(a)(3) by describing the reviewing authority's analysis of the application. Unlike the Synthetic Minor Source Permit, this Permit Analysis is not legally enforceable. The Permittee is obligated to follow the terms of the permit. Any errors or omissions in the summaries provided here do not excuse the Permittee from the requirements of the permit.

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# 1. Introduction and Summary

In a letter dated February 2, 2018, EPA Region 10 received an application from Granite Construction Company (Granite) requesting that emission limits be established in a synthetic minor source permit for its hot mix asphalt (HMA) plant on the Colville Reservation. Granite also requested that they be considered a minor source in the Title V permitting program. The HMA plant is co-located and aggregated with a stone quarrying, crushing, and screening (SQCS) facility which is subject to and operating under the EPA's SQCS General Permit.

Region 10 relied upon information provided in Granite's permit application, a performance test report dated October 31, 2017 prepared by CleanAir Engineering, and other supplementary information provided by Granite. In its supplementary information, Granite has indicated that the HMA plant will be located within the previously disturbed portion of the site only.

Granite originally applied for a synthetic minor source permit on June 29, 2012. Then on July 11, 2016, and as amended on August 8, 2016, Granite requested approval to operate under the EPA's General Permit for HMAs. Approval to operate under the EPA's General Permit was granted on September 22, 2016. Granite is now requesting a synthetic minor source permit, pursuant to the February 2, 2018 letter, to replace its current authorization to operate under the EPA's General Permit. Region 10 is using information provided by Granite, including the 2012 and 2016 applications, to develop Granite's synthetic minor source permit.

# 2. Source Information

The Granite HMA plant is located in Okanogan, Washington, within the exterior boundaries of the Colville Reservation and is in Indian Country as defined in 40 CFR Part 49. Periodically, Granite hires a contractor who owns and operates a SQCS facility to crush rock at the same site for use in the HMA plant. All of the aggregate used by the HMA plant is mined and crushed onsite. Granite has owned and operated the HMA plant at this site since April 2007.

The Granite HMA plant is an ASTEC PDM 630C hot mix asphalt plant (SIC # 2951) rated at 150 tons per hour (tph) that is powered with utility line power and the drum mixer dryer is currently configured to burn propane and natural gas but can be retrofitted to also burn liquid fuels such as fuel oil and used oil. The drum dryer was heated using propane during the performance test, noted above, to demonstrate compliance with the particulate matter limit of 0.04 grains per dry standard cubic foot (gr/dscf) applicable under New Source Performance Standard at 40 CFR Subpart I.

Granite's HMA plant heats and dries a mixed sized aggregate and combines it with liquid asphalt to create hot mix asphalt. The Granite HMA plant uses a parallel flow drum, which means the aggregate input is on the same end of the drum as the drying burner and the material flow is in the same direction through the drum as the flame exhaust.

A front-end loader loads various grade aggregate into cold feed bins that use conveyors to proportion the aggregate mix which is then passed through a screen to remove potential debris. The aggregate is then conveyed to the elevated burner side of the inclined drum. While the drum rotates and tumbles the aggregate, the burner flame dries and heats the rock to between 270° and 330° F. As the heated aggregate moves down the drum, recycled asphalt pavement (RAP) from another feeder bin and conveyor is added through an auger from the bottom, about halfway up the drum, out of the high heat area from the direct flame. A controlled proportionate amount of liquid asphalt is added and mixed in at the end of the drum to coat the aggregate, forming hot mix asphalt. To make warm mix asphalt, the aggregate and RAP are heated to the lower temperature range and small amounts of water are added along with the liquid asphalt. The hot or warm mix asphalt moves from the bottom of the drum into a drag slat conveyor to the silos where it is temporarily stored and then drop loaded into trucks for transport. Virgin asphalt generally constitutes 95% $\pm$ 2% of aggregate in the final product by weight while asphalt oil constitutes the remainder. Granite uses up to 20% RAP (with 75% aggregate and 5% asphalt oil) in this HMA plant.

A fan is used to collect the burner exhaust, steam, and suspended particulate matter from the drum and routes it through a fabric filter baghouse. The removed fines are returned to the drum for inclusion into the asphalt or sent to an enclosed waste dust collection area. The filtered air is released to the atmosphere via a vertical exhaust stack.

Along with the HMA plant, Granite also hires a subcontractor that owns and operates a stone quarrying, crushing, and screening (SQCS) facility to crush rock at the site. The SQCS facility mines, crushes and screens rock at the site for use in the co-located HMA plant. EPA's source aggregation policy requires two sources to be considered one source for permit applicability purposes if their operations are: (1) located on one or more contiguous or adjacent properties (e.g., Granite operates both a HMA facility and SQCS facility at the same site), (2) are under common control (e.g. Granite owns the site where the rock is mined and the SQCS facility is a subcontractor to Granite), and (3) belong to the same industrial grouping (two-digit Standard Industrial Classification code) or one operation supports the other operation with most of its output. HMA manufacturing (29) and nonmetallic mineral extraction & crushing (14) have different Standard Industrial Classification codes. Granite's HMA plant obtains 100% of its aggregate from the hired SQCS plant. The SQCS plant is hired by Granite to exclusively crush rock for use in the HMA plant and for direct rock sales, making the SQCS plant a support operation to the HMA plant. By hiring the SQCS operation to crush rock owned by Granite for Granite's use and Granite's site, Granite has control over the SQCS plant. In fact, Granite is the permittee for the SQCS general air permit and is responsible for compliance by the SQCS operation. Because Granite's HMA and SQCS operations meet all three of EPA's criteria for aggregation and consideration as one source, then it is necessary to count the emissions from the HMA plant and SQCS facility (while the SQCS activities support the HMA plant) to determine compliance with emission limits in this synthetic minor source permit. As a result, Granite must maintain the combined allowable emissions including fugitive emissions from the SQCS facility and HMA plant below the major source permitting thresholds under Title V.

The air pollution emission units and control devices that exist at Granite's HMA are listed and described in Table 2-1.

**Table 2-1: Emission Units and Control Devices**

| ID # | Description of Affected Emission Units | Control Technology[1] |
|---|---|---|
| 91-124 | Drum Mixer Dryer: ASTEC PDM 630C; parallel-flow design; 150 tons/hour rated capacity; manufactured 1996<br>Dryer Burner: Hauck Starjet SJO-360E; 75.6 MMBtu/hour; currently fueled with propane; burner can be retrofitted to combust natural gas, distillate fuel oils (ASTM Grades 1 and 2), residual fuel oils (ASTM Grades 4, 5, and 6) and used oil (reprocessed or waste oil); manufactured 1996. | Baghouse: Cedar Rapids 10306-P |
| 83-398A | Virgin Collector; 200 tons/hour; manufactured pre-1996 | Uncontrolled |
| 80-1980 | Virgin Belt Scale; 200 tons/hour; manufactured pre-1996 | Uncontrolled |
| 86-746 | Virgin Slinger; 200 tons/hour; manufactured pre-1996 | Uncontrolled |
| 80-1963A | Recycled Asphalt Pavement (RAP) Conveyor; 100 tons/hour; manufactured pre-1996 | Uncontrolled |
| 83-390A | RAP Conveyor; 100 tons/hour; manufactured pre-1996 | Uncontrolled |
| 80-1963B | RAP Screen; 100 tons/hour; manufactured pre-1996 | Uncontrolled |
| 83-398B | Cold Feeder 1; 50 tons/hour; manufactured pre-1996 | Uncontrolled |
| 83-398C | Cold Feeder 2; 50 tons/hour; manufactured pre-1996 | Uncontrolled |
| 83-398D | Cold Feeder 3; 50 tons/hour; manufactured pre-1996 | Uncontrolled |
| 83-390B | Bin RAP Feeder; 40 tons/hour; manufactured pre-1996 | Uncontrolled |
| 86-810 | Silo 1; 60 ton design capacity; manufactured pre-1996 | Uncontrolled |
| 86-811 | Silo 2; 35 ton design capacity; manufactured pre-1996 | Uncontrolled |
| 86-807 | Asphalt Oil Above-Ground Tank; Electrically Heated; 20,000 gallons | Uncontrolled |
| 86-808 | Asphalt Oil Above-Ground Tank; Electrically Heated; 10,000 gallons; manufactured pre-1996 | Uncontrolled |
| 03-1864 | Propane Above-Ground Tank; 20,000 gallons | Uncontrolled |
| 85-509 | Diesel Fuel Above-Ground Tank; 10,000 gallons; manufactured pre-1996 | Uncontrolled |
| A-001 | Truck Loading and Fumes: HMA truck load-out from silos and fumes from loaded truck bed while in plant; 100 tons per hour capacity; manufactured pre-1996 | Uncontrolled |
| A-002 | Vehicle Traffic: HMA trucks, aggregate and RAP trucks, asphalt trucks, loader for aggregate and RAP; manufactured pre-1996 | Wet Suppression |
| A-003 | Aggregate Storage Piles: open areas and aggregate storage piles; manufactured pre-1996 | Wet Suppression |

[1] Listed control devices are required.

Local Air Quality. The geographic area where Granite's HMA plant is located is designated as attainment/unclassifiable under the CAA for all National Ambient Air Quality Standards (NAAQS) pollutants. The available information on air quality in the area shows that ambient concentrations are well below the levels of the NAAQS.

# 3. Applicability

## 3.1 Potential to Emit

Potential to emit (PTE) means the maximum capacity of a stationary source to emit an air pollutant under its physical and operational design. This synthetic minor source permit includes enforceable physical or operational limitations on the maximum capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on the type or amount of material combusted, stored, or processed. PTE is meant to be a worst-case emissions calculation and is used in many cases to determine the applicability of federal CAA requirements. Actual emissions are lower than or equal to PTE.

## 3.2 Major Source Applicability Thresholds

In attainment and unclassifiable areas, a source is considered a major source for Title V permitting purposes if its potential emissions are greater than 100 tons per year of any regulated air pollutant, 10 tons per year of any individual HAP and 25 tons per year of all HAPs emitted (see 40 CFR 71.3). Existing sources with potential emissions above the Title V major source thresholds are subject to Title V and must obtain a Title V operating permit.

Since asphalt plants may be subject to NSPS, Subpart I which was promulgated before January 1, 1980, fugitive emissions from asphalt plants must be included in total facility emissions for Title V major source determination purposes. Therefore, while considering the emissions limitations for this synthetic minor source permit, fugitive emissions from the asphalt plant and co-located SQCS must be taken into account.

## 3.3 Proposed Allowable Emissions

As shown is Tables 3-1 and 3-2, Granite's HMA plant, combined with the SQCS plant, has the potential to emit more than 250 tpy of PM and more than 100 tpy of SO2 emissions. PM is not subject to the 100 tpy Title V threshold because Title V does not define PM as a regulated air pollutant. See Appendix A for emission inventory details. Without the practically enforceable emissions limitation contained within the synthetic minor source permit, Granite is considered a major source for SO2 under the Title V permitting program and PM under the PSD.

**Table 3-1: Granite HMA Plant Potential to Emit**

| Emission Unit | Annual Potential Emissions (tons per year)[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | CO | Pb | NOx | PM | PM10 | PM2.5 | SO2 | VOC | CH2O | HAPs |
| Drum Dryer | 85 | <1 | 58 | 59 | 15 | 15 | 265 | 21 | 2 | 7 |
| Storage Tanks | | | | | | | | <1 | | <1 |
| Aggregate Handling | | | | 44 | 17 | 12 | | | | |
| Silo Filling | <1 | | | <1 | <1 | <1 | | 8 | | <1 |
| Truck Loading/ Fumes | 1 | | | <1 | <1 | <1 | | 3.25 | | <1 |
| Traffic | | | | 188 | 51 | 5 | | | | |
| Wind Erosion | | | | <1 | <1 | <1 | | | | |
| **Calculated PTE** | 87 | <1 | 58 | 292 | 84 | 33 | 265 | 32 | 2 | 7 |

[1] Carbon monoxide; lead; nitrogen oxides; particulate matter; particulate matter less than 10 microns and 2.5 microns; sulfur dioxide; volatile organic compounds; formaldehyde (highest plant-wide single HAP); total hazardous air pollutants.

**Table 3-2: Granite SQCS Plant Potential Emissions**

| Process | Pollutant (tons/year) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | CO | NOx | PM | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | VOC | CH2O |
| SQCS Facility | 0 | 0 | 30 | 15 | 1 | 0 | 0 | 0 |

The emission estimates in Appendix A considered the most stringent, existing applicable emission limits (generally FARR or NSPS limits) paired with the worst-case fuel type that can be used by the equipment to determine the worst-case emissions that are currently allowed, assuming full-time operation at full capacity, which would produce approximately 1,314,000 tons of HMA per year. Note that individual HAP PTE estimates were based on the worst-case fuel (waste oil/reprocessed fuel oil) for any single HAP, while the emission unit HAP PTE was based on a summation of the worst-case fuel for the emission unit. Source-wide HAP PTE was a summation of the emission units' HAP PTE. Emission testing performed in 2017 demonstrated that actual PM emissions were well below the NSPS limit. The PTE emission estimates do not include generator engines as Granite has electrical line power at the site.

Granite's HMA emissions will be limited to below the major source thresholds for Title V making the Granite HMA plant a synthetic minor source for Title V permitting purposes in attainment and unclassifiable areas. The proposed allowable emissions from the HMA plant contained in Table 3-3 below are based on production throughput limits of 300,000 tons of hot mix asphalt per year as specified in the synthetic minor source permit. See Appendix B for emission inventory details. The SQCS allowable emissions presented in Table 3-3 are based on the material throughput limits specified in Granite's SQCS General Permit that has been issued

to Granite. See https://www.epa.gov/caa-permitting/stone-quarrying-crushing-and-screening-facilities-general-air-quality-permit-0.

**Table 3-3: Granite Combined HMA and SQCS Proposed Allowable Emissions**

| | Pollutant (tons/year) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Process** | **CO** | **NOx** | **PM[1]** | **$PM_{10}$** | **$PM_{2.5}$** | **$SO_2$** | **VOC** | **CH2O** |
| HMA Plant | 20 | 13 | 68 | 19 | 8 | 21 | 7 | 0.5 |
| SQCS Facility | 0 | 0 | 30 | 15 | 1 | 0 | 0 | 0 |
| Co-located HMA Plant and SQCS Facility | 20 | 13 | 98 | 34 | 9 | 21 | 7 | 0.5 |

**[1] Particulate Matter (PM) is not a regulated pollutant under the Title V program and therefore is not subject to the 100 ton per year threshold.**

As shown in Table 3-3, the combined allowable (and hence potential) emissions from Granite's HMA plant co-located with their SQCS facility will be limited below the major source permitting thresholds for Title V.

# 4. Additional Analyses

EPA Trust Responsibility. As part of the EPA Region 10's direct federal implementation and oversight responsibilities, Region 10 has a trust responsibility to each of the 271 federally recognized Indian tribes within the Pacific Northwest and Alaska. The trust responsibility stems from various legal authorities including the U.S. Constitution, Treaties, statutes, executive orders, historical relations with Indian tribes and, in this case, the Treaty of June 9, 1855. In general terms, the EPA is charged with considering the interest of tribes in planning and decision-making processes. Each office within the EPA is mandated to establish procedures for regular and meaningful consultation and collaboration with Indian tribal governments in the development of EPA decisions that have tribal implications. In a letter dated May 15, 2018, Region 10's Office of Air and Waste invited the Tribe to formal consultation on this synthetic minor permit project. While the tribe did not request formal consultation, EPA has maintained ongoing communications with Tribal environmental staff throughout the permitting process.

Endangered Species Act (ESA). Under the ESA, the EPA is obligated to consider the impact that a federal project may have on listed species or critical habitats. It is the EPA's conclusion that the issuance of this synthetic minor source permit will not affect a listed species or critical habitat because it does not authorize any changes to the physical footprint of the existing facility or any increases in production or emissions. Therefore, no additional analysis and no additional requirements will be added to this permit for the ESA. The EPA's "no effect" determination concludes the EPA's obligations under Section 7 of the ESA. For more information about the EPA's obligations, see the Endangered Species Consultation Handbook: Procedures for

Conducting Consultation and Conference Activities under Section 7 of the ESA, published by the US Fish and Wildlife Service (FWS) and National Marine and Fisheries Service (NMFS, March 1998, Figure 1).

National Historic Preservation Act. Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve throughout the country. If a federal or federally-assisted project has the potential to affect historic properties, a Section 106 review is conducted. As noted earlier, the issuance of this permit does not authorize any changes to the physical footprint of the existing facility. In addition, no increases in production or emissions are being authorized as a result of this permit action. Consequently, no adverse effects are expected, and further review under the NHPA is not necessary. The Tribal Historic Preservation Officer reviewed this permitting action and determined that no historical properties will be affected.

Environmental Justice Policy - Under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* signed on February 11, 1994, the EPA is directed, to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States. The issuance of this permit places voluntary limits on the operation of the facility and does not authorize any changes to the physical footprint of the existing facility or any increases in production or emissions. EPA therefore concludes that this permit action will not have a disproportionately high or adverse human health effects on nearby communities.

Title V Permitting Program. Title V of the CAA and the implementing regulation found in 40 CFR part 71 require Title V major sources (as well as a selection of non-major sources) of air pollution to obtain operating permits. In general, a source is major for Title V purposes if it has the potential to emit 100 tons per year or more of any air pollutant subject to regulation, 25 tons per year or more of HAPs (in aggregate) or 10 tons per year or more of any single HAP (see 40 CFR § 71.3). Granite's facility will no longer be a Title V major source because it is taking federally enforceable limitations to restrict its potential to emit to less than the major source thresholds for Title V. Accordingly, Granite is not required to submit an application for a Title V permit.

Prevention of Significant Deterioration (PSD) and Minor New Source Review (NSR) Permitting Programs. The PSD permitting program requires sources to obtain approval before beginning actual construction of any new major stationary source or a major modification at any existing major source. In general, a source is major for PSD if it has the potential to emit 250 tons per year or more of any regulated NSR pollutant. The PSD permitting program is found at 40 CFR part 52.21. Minor NSR requires minor sources to obtain approval before beginning actual construction of a new minor source or a minor modification at an existing minor or major source. In general, a source is minor for Minor NSR if it has the potential to emit less than the major source thresholds for PSD of any regulation NSR program. Minor NSR is found at 40 CFR parts

49.151 through 49.164. However, the Minor NSR program at 40 CFR part 49.158 allows sources to obtain a synthetic minor source permit containing restrictions so that its potential to emit is less than the major source permitting thresholds for PSD. This synthetic minor source permit does not authorize construction of any new emissions unit or modification of any existing emissions unit.

New Source Performance Standards (NSPS). Granite's HMA plant is subject to the NSPS at 40 CFR Part 60, Subpart I, because the asphalt plant was constructed in 1996, well after the June 11, 1973, cutoff for applicability. The standard includes a particulate matter emission limit of 0.04 grains per dry standard cubic foot of exhaust and an opacity limit of 20% or greater. The standard also requires a source test upon startup. The permittee performed emissions testing of the drum dryer in October 2017 that demonstrated compliance with the NSPS limits. The NSPS requirements are not included in the permit; however, the permittee is still subject to the standard and responsible for complying with the limit. The particulate matter emission limit was also used to evaluate worst-case "allowable" potential to emit estimates in the emission inventory.

Section 112 and National Emission Standards for Hazardous Air Pollutants (NESHAP). There are no CAA Section 112 that apply to the emissions units at Granite.

Section 111(d) and Section 129 Regulations. There are no CAA Section 111(d) or 129 regulations that apply to the emissions units at Granite.

Federal Air Rules for Reservations (FARR). On April 8, 2005, the EPA promulgated a Federal Implementation Plan for Reservations in Idaho, Oregon and Washington, commonly referred to as the FARR. The EPA published the FARR rules that generally apply to Indian Reservations in Region 10 in 40 CFR §§ 49.121 to 49.139. The FARR rules that specifically apply on the Colville Reservation (Sections 123, 124, 125, 126, 127, 128, 129, 130, 131, 135, 137, 138 and 139) are codified at 40 CFR §§ 49.9951 to 49.9960. FARR requirements contained in 49.124, 125, 126, 129, and 130 create limits on Granite's potential to emit and have been taken into consideration as specified in the emissions inventory in Appendix A and B.

Ambient Air Quality. This permit action does not authorize an increase in production or emissions, so it is not expected to cause an increase in ambient air pollution concentrations.

# 5. Permit Content

The permit is organized into the following five sections and includes all the permit content requirements found into 40 CFR § 49.155:

Permit Section 1: Source Information and Project Description
Permit Section 2: General Requirements
Permit Section 3: Emission Limitations and Work Practice Requirements
Permit Section 4: Testing, Monitoring and Recordkeeping Requirements
Permit Section 5: Notification and Reporting Requirements

Permit Section 6: Changes to this Permit

Each permit condition in the permit is explained below. Specific analyses that were performed in development of the permit are described or referenced.

**Permit Section 1 – Source Information and Project Description**

This permit section contains a brief description of the facility and project (permitting action). A more detailed description of the facility can be found in Section 2 of this Permit Analysis. Note that the control devices listed and described in the Table 1-1 of the permit are required by this permit. This section identifies the emissions units subject to this permit pursuant to 49.155(a)(1)(ii).

**Permit Section 2 – General Requirements**

Permit Conditions 2.1 requires the permittee to operate the source in accordance with the permit as required by 40 CFR 49.151(d)(2).

Permit Conditions 2.2 requires the HMA plant to operate only within the previously disturbed portion of the quarry and only at the specified location.

Permit Conditions 2.3 establishes that this permit does not release the permittee from its obligations to comply with all other applicable requirements pursuant to 40 CFR 49.151(d)(4).

Permit Conditions 2.4 is the severability clause required by 40 CFR 49.155(a)(6).

Permit Conditions 2.5 is a general provision required by 49.155(a)(7)(i).

Permit Conditions 2.6 is a general provision required by 49.155(a)(7)(ii).

Permit Conditions 2.7 is a general provision required by 49.155(a)(7)(iii).

Permit Conditions 2.8 is a general provision required by 49.155(a)(7)(v).

Permit Conditions 2.9 is a general provision required by 49.155(a)(7)(vi).

Permit Conditions 2.10 is a general provision required by 49.155(a)(7)(vii).

Permit Conditions 2.11 is a requirement to assure the permittee maintains a copy of the permit at the site of operation; properly identifies the emissions units authorized for operation under the permit; and is fully aware of its responsibilities to comply with all of the requirements contained in this permit consistent with 49.155(a)(1)(iii).

Permit Conditions 2.12 is the credible evidence requirement provided for by Section 113(a) of

the CAA and the 1990 CAA amendments and 40 CFR 49.123(d) to give EPA and Region 10 authority to use any available information to ensure continuous compliance with the permit conditions. For further explanation see 62 Fed. Reg. 8314 (Feb. 24, 1997).

Permit Condition 2.13 is a requirement to ensure the words used in the permit are construed consistent with the definitions in 49.152 and 52.21 pursuant to 40 CFR 49.152(b).

**Permit Section 3 – Emission Limitations and Work Practice Requirements**

The emissions limitations and work practice requirements in this Section of the Permit are established pursuant to 49.155(a)(1)(ii) and 49.155(a)(2):

Permit Condition 3.1 requires good air pollution control practices for minimizing emissions.

Permit Condition 3.2 is an owner-requested production limit of 300,000 tons per year of hot mix asphalt to limit emissions below the major source permitting thresholds. Based on this annual limit, calculated each month, Granite's synthetic minor limit is enforceable as a practical matter. The permittee has committed to meet the monthly-rolling annual production limit.

Permit Condition 3.3 The percent of RAP used in the asphalt cement mix under this permit is limited to the percent of RAP used during the most recent source testing conducted by Granite. See performance test report dated October 31, 2017, prepared by CleanAir Engineering, pages 188-190).

Permit Condition 3.4 specifies the fuels that can be combusted. The permittee requested approval to use this list of fuels. The potential to emit calculations in Appendices A and B relied upon the fuels specified by this requirement to determine the allowable emissions.

Permit Condition 3.5 limits the amount of sulfur in the liquid fuels to levels requested by the permittee. The requested sulfur content limits meet the FARR requirements in 40 CFR 49.130. The potential to emit in Appendices A and B relied upon the sulfur content specified by this requirement to determine the allowable emissions.

Permit Condition 3.6 limits the sulfur content in the natural gas and propane combusted in the drum dryer. This limit was requested by the permittee and meets the limits specified in 40 CFR 49.130. The potential to emit in Appendices A and B relied upon the sulfur content specified by this requirement to determine the allowable emissions.

Permit Condition 3.7 is a requirement that all emissions from the drum mixer dryer are routed through the baghouse. The emissions factors relied up in this permit are assumed to reflect operation of this air pollution control technology which is necessary to comply with the applicable 40 CFR Subpart I emissions limitation and to maintain the allowable emissions from the source below the major source permitting thresholds.

Permit Condition 3.8 is a requirement to assure that the baghouse is properly maintained, such that the emissions factors used are representative of actual operations.

Permit Condition 3.9 is a requirement that reflects the fugitive particulate matter limitation applicable under 40 CFR 49.126 and Granite is currently using Attachment C to comply with this requirement. Based on the emissions inventory in Appendices A and B, the largest sources of particulate emissions (fugitive or non-fugitive) at this HMA plant are vehicle traffic and aggregate handling and screening. The emissions factors used to estimate these fugitives have some amount of uncertainty based on the limited data set used to establish these emissions factors. EPA believes it is reasonable to apply a margin of error when using these emissions factors to account for this uncertainty. The fugitive matter particulate emissions limitations established in this permit help ensure that there is a low-probability that emissions from this source will exceed the Title V major source permitting thresholds.

Permit Condition 3.10 is a requirement that reflects the limitation applicable under 40 CFR 49.124 and 40 CFR Subpart I. Based on the emissions inventory in Appendices A and B, the largest sources of particulate emissions (fugitive or non-fugitive) at this HMA plant are vehicle traffic and aggregate handling and screening. The emissions factors used to estimate these fugitives have some amount of uncertainty based on the limited data set used to establish these emissions factors. EPA believes it is reasonable to apply a margin of error when using these emissions factors to account for this uncertainty. This opacity limitation helps ensure that there is a low-probability that emissions from this source will exceed the Title V major source permitting thresholds.

Permit Condition 3.11 is a requirement to assure the drum mixer burner is operated efficiently consistent with Condition 3.1 and the CO emissions factor used is representative of actual operations. In addition, this requirement helps ensure that there is a low-probability that emissions from this source will exceed the Title V major source permitting thresholds.

**Permit Section 4 – Testing, Monitoring, and Recordkeeping Requirements**

Permit Condition 4.1 is a monitoring requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(3) to assure compliance with the requirement in Permit Condition 3.1 that the baghouse is maintained consistent with good air pollution control practices and the emission limitation specified by Permit Condition 3.8.

Permit Condition 4.2 is a monitoring requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(3) to assure compliance with Permit Condition 3.10.

Permit Condition 4.3 is a monitoring requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(3) to assure compliance with Permit Condition 3.9.

Permit Condition 4.4 is a recordkeeping requirement pursuant to 49.155(a)(4)(ii) to maintain all records specified by this permit for 5 years.

Permit Condition 4.5 is a recordkeeping requirement to pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure the source is operated consistent with the permit application as required in Permit Condition 2.1.

Permit Condition 4.6 is a recordkeeping requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure compliance with Permit Conditions 3.2 and 3.3.

Permit Condition 4.7 is a recordkeeping requirement pursuant to 49.155(a)(4) to assure compliance with Permit Condition 3.4.

Permit Condition 4.8 is a recordkeeping requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure compliance with Permit Conditions 3.5 and 3.6.

Permit Condition 4.9 is a recordkeeping requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure compliance with the monitoring requirement at Permit Conditions 3.8 and 4.1.

Permit Condition 4.10 is a recordkeeping requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure compliance with the monitoring requirement at Permit Condition 4.2.

Permit Condition 4.11 is a recordkeeping requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure compliance with the monitoring requirement at Permit Condition 4.3.

Permit Condition 4.12 is a recordkeeping requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(4) to assure compliance with the work practice requirement at Permit Condition 3.11.

**Permit Section 5 – Notification and Reporting Requirements**

Permit Condition 5.1 requires written notification to EPA when the ownership or operator of the HMA plant changes pursuant to 49.155(a)(1)(iii).

Permit Condition 5.2 requires the permittee to submit a report of any permanent or indefinite closure to the EPA.

Permit Condition 5.3 is an annual reporting requirement pursuant to 49.155(a)(1)(iii) and 49.155(a)(5)(i).

Permit Condition 5.4 is a deviation reporting requirement pursuant to 49.155(a)(5)(ii).

Permit Condition 5.5 specifies where to submit reports, noting that a copy should always be sent to the Tribal environmental office.

Permit Condition 5.6 requires the permittee to certify the truth, accuracy and completeness of all

to reports submitted to EPA. The certification must be signed by a responsible official as defined in Attachment B. The facility's responsible official is listed on the first page of the permit. The permittee must request an administrative amendment of the permit if the responsible official for the facility changes.

**Permit Section 6 – Changes to this Permit**

Permit Condition 6.1 specifies the options for changing the permit as provided for by 49.155(a)(7)(iv).

Permit Condition 6.2 specifies the process for terminating coverage under this permit as provided for by 49.155(a)(7)(iv).

# 6. Public Participation

## 6.1 Public Notice and Comment

As required in 40 CFR § 49.157, this final synthetic minor source permit was publicly noticed and made available for public comment for 30 days as follows:

40 CFR § 49.157(a) requires the reviewing authority to make available for public inspection at the appropriate EPA Regional Office and in at least one location in the area affected by the source, such as the Tribal environmental office or a local library, the application, additional information requested, a copy of the draft permit and permit analysis of the application.

All of these permitting related documents were made available for public inspection at the EPA Region 10 Library and at three different locations in the area near the source. These locations included the Omak Public Library, Okanogan Public Library, and the Tribal environmental office located in the Lucy F. Covington Government Center on the Colville Reservation.

40 CFR § 49.157(b)(1) requires the reviewing authority to provide adequate public notice to ensure that the affected community and the general public have reasonable access to the application and draft permit information, as set out in 49.157(b)(1)(i) and (ii). The public notice must provide an opportunity for public comment and notice of a public hearing, if any, on the draft permit.

The public notice for this permitting action was posted on Region 10's website at https://www.epa.gov/publicnotices/notices-search/location/Washington from December 28, 2018 to January 31, 2019. In addition, the public notice was published in the Omak–Okanogan County Chronicle newspaper on December 28, 2018. The application and draft permit information were made available to the public at the locations stated above. The only comments received were from the permittee Granite. No public hearing was requested or held. The public notice informed the public of the opportunity to comment on the draft permit and to hold a public hearing.

40 CFR § 49.157(b)(2) lists the information that must be included in the public notice.

A public notice containing all of the information specified by this requirement was posted on Region 10's web site and in the Omak-Okanogan County Chronicle newspaper.

40 CFR § 49.157(c) explains how to submit comments and what the requirements are for holding a public hearing.

The public notice posted on Region 10's web site and in the Omak-Okanogan County Chronicle newspaper included an explanation of how to submit comments to Region 10 and the requirements necessary to hold a public meeting.

### 6.2 Response to Public Comments and Permit Issuance

After the public comment period closes, Region 10 will consider all comments in making a final decision. As required in 40 CFR § 49.159, Region 10 will notify the permittee and provide public notice of the final decision. The permit becomes effective 30 days after service of notice of the final permit decision, unless (1) a later effective date is specified in the permit; (2) review of the final permit is requested under 40 CFR 49.159(d) (in which case the specific terms and conditions of the permit that are the subject of the request for review must be stayed); or (3) the reviewing authority makes the permit effective immediately upon issuance (if no comments were made that requested a change in the draft permit or a denial of the permit).

The public comment period for this permit began on December 28, 2018 and ended on January 31, 2019. EPA Region 10 received comments from the permittee Granite only. EPA has considered the permittee's comments in preparing a final permit and permit analysis and has documented a response to these comments below explaining whether any changes to the permit resulted and the reason the change was or was not made. EPA will send the final permit and permit analysis to each person who provided comments on the draft permit to operate and EPA will make available the final permit and permit analysis to the public at all of the locations where the draft permit was made available. The final permit and permit analysis will also be sent to the company Granite, the Colville Tribes Chairman, the Colville Tribes environmental office, and the local air pollution authorities having jurisdiction adjacent to the Colville Reservation including the Washington State Department of Ecology's Eastern and Central Regional Offices. A public notice of the final permit decision will be posted on Region 10's web site for 30 days at https://www.epa.gov/caa-permitting/caa-permitting-epas-pacific-northwest-region.

**Responses to Comments from the permittee, Granite Construction Company:**

Granite Comment:
Upon review of the draft permit and accompanying appendices, I noticed an inconsistency in the emission factor used to calculate the potential to emit (PTE) Hydrogen Chloride (HCl). In Appendices A and B, the emission factor for HCl is referenced from the document AP-42, Table 1.11-3 for RFO small boilers. In Chapter 1.11 of AP-42, these small boilers and space heaters are

described as small combustion units, *generally less than 250,000 Btu/hr*. The burner listed in this application is rated at 75.6 MMBTU. The correct emission factor based on the size of this burner, should be the emission factor seen in AP-42, Table 11.1-8 for HCl of 0.00021 lb/ton of HMA produced. This is from the chapter in AP-42 in which all other emission factors used in the calculations were obtained. Chapter 11.1 focuses solely on HMA plants and the emissions associated with them. I do not see why the emission factor for a small boiler would be used in this case.

In addition, the footer on pages A-1 of Appendices A and B, does not appear to have the correct company name, nor the correct permit reference listed.

EPA Response: Granite's requested changes have been accepted and incorporated into the final permit and permit analysis.

# 7. Abbreviations and Acronyms

| | |
|---|---|
| Btu | British thermal units |
| CAA | Clean Air Act [42 U.S.C. section 7401 et seq.] |
| CFR | Code of Federal Regulations |
| CO | Carbon monoxide |
| EJ | Environmental Justice |
| EPA | United States Environmental Protection Agency (also U.S. EPA) |
| ESA | Endangered Species Act |
| EU | Emission Unit |
| FARR | Federal Air Rules for Reservations |
| Gal | Gallon(s) |
| HAP | Hazardous air pollutant |
| Hr | Hour |
| Lb | Pound (lbs = pounds) |
| MACT | Maximum Achievable Control Technology (40 CFR Part 63) |
| NAAQS | National Ambient Air Quality Standard |
| NHPA | National Historical Preservation Act |
| NOx | Nitrogen oxides |
| NSPS | New Source Performance Standard |
| PM | Particulate matter |
| $PM_{10}$ | Particulate matter less than or equal to 10 microns in aerodynamic diameter |
| $PM_{2.5}$ | Particulate matter less than or equal to 2.5 microns in aerodynamic diameter |
| PSD | Prevention of significant deterioration |
| PTE | Potential to emit |
| Region 10 | U.S. EPA, Region 10 |
| SIC | Standard Industrial Code |
| $SO_2$ | Sulfur dioxide |
| tpy | Tons per year |
| VOC | Volatile organic compound |

# Appendix A

## Emissions Inventory based on no Synthetic Minor Source Permit

Granite Construction Company
Hot Mix Asphalt Plant

Permit Analysis
Synthetic Minor Source Permit
R10TNSR01700

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Summary of Facility Potential Criteria Air Pollutant Emissions

**Potential to Emit, (tons per year)**

**Point Sources**

| | EU 1 | EU 2 | EU 3 | EU 4 | EU 5 | EU 6 | EU 7 | |
|---|---|---|---|---|---|---|---|---|
| | Drum Dryer | Storage Tanks | Aggregate Handling | Silo Filling | Truck Loading & Fumes | Traffic | Wind Erosion | **Point Source Subtotals** |
| Carbon Monoxide (CO) | 85.41 | 0.01 | | 0.78 | | | | 86.20 |
| Lead (Pb) | 0.01 | 0.00 | | 0.00 | | | | 0.01 |
| Nitrogen Oxides (Nox) | 57.82 | 0.00 | | 0.00 | | | | 57.82 |
| Particulates (PM) | 59.42 | 0.00 | | 0.38 | | | | 59.80 |
| Fine Particulates (PM10) | 15.31 | 0.00 | | 0.38 | | | | 15.69 |
| Fine Particulates (PM2.5) | 15.31 | 0.00 | | 0.38 | | | | 15.69 |
| Sulfur Dioxide (SO2) | 265.40 | 0.00 | | 0.00 | | | | 265.40 |
| Volatile Organic Compounds (VOC) | 21.02 | 0.08 | | 8.01 | | | | 29.11 |

**Fugitive Sources**

| | EU 1 | EU 2 | EU 3 | EU 4 | EU 5 | EU 6 | EU 7 | |
|---|---|---|---|---|---|---|---|---|
| | Drum Dryer | Storage Tanks | Aggregate Handling | Silo Filling | Truck Loading & Fumes | Traffic | Wind Erosion | **Fugitive Source Subtotals** |
| Carbon Monoxide (CO) | | | 0.00 | | 1.12 | 0.00 | 0.00 | 1.12 |
| Lead (Pb) | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| Nitrogen Oxides (Nox) | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| Particulates (PM) | | | 44.05 | | 0.12 | 187.63 | 0.78 | 232.58 |
| Fine Particulates (PM10) | | | 16.73 | | 0.34 | 50.56 | 0.37 | 67.99 |
| Fine Particulates (PM2.5) | | | 12.23 | | 0.34 | 5.06 | 0.02 | 17.65 |
| Sulfur Dioxide (SO2) | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| Volatile Organic Compounds (VOC) | | | 0.00 | | 3.25 | 0.00 | 0.00 | 3.25 |

**All Sources**

| | EU 1 | EU 2 | EU 3 | EU 4 | EU 5 | EU 6 | EU 7 | |
|---|---|---|---|---|---|---|---|---|
| | Drum Dryer | Storage Tanks | Aggregate Handling | Silo Filling | Truck Loading & Fumes | Traffic | Wind Erosion | **Plantwide Totals** |
| Carbon Monoxide (CO) | 85.41 | 0.01 | 0.00 | 0.78 | 1.12 | 0.00 | 0.00 | 87.32 |
| Lead (Pb) | 0.0099 | 0.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Nitrogen Oxides (Nox) | 57.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 57.82 |
| Particulates (PM) | 59.42 | 0.00 | 44.05 | 0.38 | 0.12 | 187.63 | 0.78 | 292.38 |
| Fine Particulates (PM10) | 15.31 | 0.00 | 16.73 | 0.38 | 0.34 | 50.56 | 0.37 | 83.68 |
| Fine Particulates (PM2.5) | 15.31 | 0.00 | 12.23 | 0.38 | 0.34 | 5.06 | 0.02 | 33.34 |
| Sulfur Dioxide (SO2) | 265.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 265.40 |
| Volatile Organic Compounds (VOC) | 21.02 | 0.08 | 0.00 | 8.01 | 3.25 | 0.00 | 0.00 | 32.36 |

**Plantwide PTE Limits**

| | | |
|---|---|---|
| Carbon Monoxide (CO) | 87 | tpy, based on emission limit in FARR Non-Title V permit |
| Lead (Pb) | N/A | |
| Nitrogen Oxides (Nox) | 58 | tpy, based on emission limit in FARR Non-Title V permit |
| Particulates (PM) | 292 | tpy, based on emission limit in FARR Non-Title V permit |
| Fine Particulates (PM10) | 84 | tpy, based on emission limit in FARR Non-Title V permit |
| Fine Particulates (PM2.5) | 33 | |
| Sulfur Dioxide (SO2) | 265 | tpy, based on emission limit in FARR Non-Title V permit |
| Volatile Organic Compounds (VOC) | 32 | tpy, based on emission limit in FARR Non-Title V permit |

**Notes:**
1. The "All Sources" table sums the values in the "Point Sources" and "Fugitive Sources" tables above
2. PM2.5 is assumed to be 100% of PM10 when there are no PM2.5 emission factors for a particular activity.

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Summary of Facility Potential Hazardous Air Pollutant (HAP) Emissions

**Potential to Emit, (tons per year)**

| **Inorganics** | EU 1 Drum Dryer | EU 2 Storage Tanks | EU 4 Silo Filling | EU 5 Truck Loading & Fumes | Single HAP Plantwide Totals (tpy) |
|---|---|---|---|---|---|
| Antimony Compounds | 1.18E-04 | | | | 1.18E-04 |
| Arsenic Compounds (incl arsine) | 3.68E-04 | | | | 3.68E-04 |
| Beryllium Compounds | 0.00E+00 | | | | 0.00E+00 |
| Cadmium Compounds | 2.69E-04 | | | | 2.69E-04 |
| Chromium Compounds (incl hexavalent) | 3.61E-03 | | | | 3.61E-03 |
| Cobalt Compounds | 1.71E-05 | | | | 1.71E-05 |
| Lead Compounds (not elemental lead) | 9.86E-03 | | | | 9.86E-03 |
| Manganese Compounds | 5.06E-03 | | | | 5.06E-03 |
| Mercury Compounds | 1.71E-03 | | | | 1.71E-03 |
| Nickel Compounds | 4.14E-02 | | | | 4.14E-02 |
| Phophorus Compounds | 1.84E-02 | | | | 1.84E-02 |
| Selenium Compounds | 2.30E-04 | | | | 2.30E-04 |
| **Organics** | | | | | |
| Acetaldehyde | 8.54E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.54E-01 |
| Acrolein | 1.71E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.71E-02 |
| Benzene | 2.56E-01 | 1.78E-03 | 2.56E-03 | 1.80E-03 | 2.62E-01 |
| Bromomethane (methyl bromide) | 0.00E+00 | 2.73E-04 | 3.92E-04 | 3.32E-04 | 9.97E-04 |
| 1,3-Butadiene | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Carbon Disulfide | 0.00E+00 | 8.92E-04 | 1.28E-03 | 4.49E-04 | 2.62E-03 |
| Chloroethane (ethyl chloride) | 0.00E+00 | 2.23E-04 | 3.20E-04 | 7.26E-06 | 5.50E-04 |
| Chloromethane (methyl chloride) | 0.00E+00 | 1.28E-03 | 1.84E-03 | 5.18E-04 | 3.64E-03 |
| Cumene | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Dichlorobenzene | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.80E-03 | 3.80E-03 |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | 1.38E-10 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.38E-10 |
| Ethyl Benzene | 1.58E-01 | 2.12E-03 | 3.04E-03 | 9.67E-03 | 1.73E-01 |
| Formaldehyde | 2.04E+00 | 3.85E-02 | 5.52E-02 | 3.04E-03 | 2.13E+00 |
| Furans (all PCDF) | 2.63E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.63E-08 |
| Hexane (incl n-Hexane) | 6.04E-01 | 5.57E-03 | 8.01E-03 | 5.18E-03 | 6.23E-01 |
| Hydrogen Chloride | 1.38E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.38E-01 |
| Isooctane (2,2,4-trimethylpentane) | 2.63E-02 | 1.73E-05 | 2.48E-05 | 6.22E-05 | 2.64E-02 |
| Methyl Chloride (chloromethane) | 0.00E+00 | 1.50E-05 | 2.16E-05 | 0.00E+00 | 3.67E-05 |
| Methyl Chloroform (1,1,1-trichloroethane) | 3.15E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.15E-02 |
| Methyl tert-Butyl Ether (MTBE) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Naphthalene[1] (also a POM) | 4.27E-01 | 0.00E+00 | 3.04E-03 | 1.18E-02 | 4.42E-01 |
| Phenol | 0.00E+00 | 0.00E+00 | 1.97E-03 | 1.12E-02 | 1.31E-02 |
| Polycyclic Organic Matter* (incl naphthalene) | 5.81E-01 | 0.00E+00 | 1.90E-02 | 2.23E-02 | 6.23E-01 |
| Propionaldehyde | 8.54E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.54E-02 |
| Quinone | 1.05E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.05E-01 |
| Styrene | 0.00E+00 | 3.01E-04 | 4.32E-04 | 2.53E-04 | 9.86E-04 |
| Tetrachloroethane | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.66E-04 | 2.66E-04 |
| Toluene | 1.91E+00 | 3.46E-03 | 4.96E-03 | 7.26E-03 | 1.92E+00 |
| Xylene (incl isomers and mixtures) | 1.31E+00 | 1.43E-02 | 2.06E-02 | 1.69E-02 | 1.37E+00 |

| | EU 1 Drum Dryer | EU 2 Storage Tanks | EU 4 Silo Filling | EU 5 Truck Loading & Fumes |
|---|---|---|---|---|
| **Emission Unit HAP Totals** | 7.012 | 0.069 | 0.120 | 0.083 |

| | | | |
|---|---|---|---|
| **Plantwide HAP Total** | 7.283 | tons per year | |
| **Highest Plantwide Single HAP** | 2.133 | tons per year | (formaldehyde) |

**Notes:**
1. Emission-Unit HAP Totals will not equal the sum of individual pollutants
2. Isomers of xylene (m-, p-, o-) are grouped as Xylenes for applicability even though the individual isomers are each listed HAPs in the Clean Air Act
3. Emission units #4, 7 and 8 are not known to emit HAPs

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

**Criteria Air Pollutant Emission Inventory**

Emission Unit: **#1 Drum Dryer**
Description: Hot Mix Asphalt Plant Drum Dryer - parallel flow drum mix design
Control: Baghouse
Fuel: RF0, #2 diesel, propane or natural gas (RF0, reprocessed fuel oil is called waste oil by AP-42)
Capacity: 150 tph hot mix asphalt Burner: 75.6 mmBtu/hr capacity
Operation: 8760 hours/year

**Potential to Emit, (tons per year)**

| | RF0 | | #2 Diesel | | Natural Gas | | Max |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | 0.13 | 85.4 | 0.13 | 85.4 | 0.13 | 85.4 | 85.4 |
| Lead | 1.5E-05 | 0.010 | 1.5E-05 | 0.010 | 6.2E-07 | 0.000 | 0.01 |
| NOx | 0.055 | 36.1 | 0.055 | 36.1 | 0.088 | 57.8 | 57.8 |
| PM | 0.090 | 59.4 | 0.090 | 59.4 | 0.090 | 59.4 | 59.4 |
| PM10 | 0.023 | 15.3 | 0.023 | 15.3 | 0.023 | 15.3 | 15.3 |
| PM2.5 | 0.023 | 15.3 | 0.023 | 15.3 | 0.023 | 15.3 | 15.3 |
| SO2 | 0.404 | 265.4 | 0.127 | 83.4 | 0.016 | 10.8 | 265.4 |
| VOC | 0.032 | 21.0 | 0.032 | 21.0 | 0.032 | 21.0 | 21.0 |

**Estimation Explanations**
Emission factor (EF) units are lb/ton HMA product
Worst-case PTE is the higher emitting of the fuel options taking into consideration the most stringent emission limits that exist

CO factor: Option 1: For RFO, diesel, natural gas: AP-42 3/04, Hot Mix Asphalt Plants, Table 11.1-7, uncontrolled (factor can vary greatly) (lb/tonHMA) = 0.13
Option 2: EF based on actual test data while burning propane
EF = (ppm limit) * (1.66E-7 lb/dscf / ppm) * (21-O2test) / (21-O2limit) * (dscf test/min) * (60 min/hr) / (tph HMA)
CO Result = 122 ppm @ 3%O2 MW of CO= 28
measured flow rate = 30600 dscf/min measured during May 2017 test
O2 during test = 16.7 % measured during May 2017 test
Result O2 = 3 %
production during test = 116 ton/hr HMA
emission factor = 0.034 lb/ton HMA
Measured CO emissions are much lower than AP-42 predicts; use the AP42 EF to be conservative.

Lead factor: For RFO, diesel, natural gas: AP-42 3/04, Table 11.1-12, fabric filter controlled (note: assumes fabric filter is necessary to meet NSPS PM limit)

NOx factor: Option 1: For RFO, diesel, natural gas: AP-42 3/04, Table 11.1-7 RF0, uncontrolled (lb/tonHMA) = 0.055 (fuel oil) 0.026 (nat gas)
Option 2: EF Based on test data while burning propane
EF = (ppm limit) * (1.66E-7 lb/dscf / ppm) * (21-O2test) / (21-O2limit) * (dscf test/min) * (60 min/hr) / (tph HMA)
NOx Result = 194 ppm @ 3%O2 MW of NO2= 46
measured flow rate = 30600 dscf/min measured during May 2017 test
O2 during test = 16.7 % measured during May 2017 test
Result O2 = 3 %
production during test = 116 ton/hr HMA
emission factor = 0.088 lb/ton HMA
Measured NOx emissions are higher than AP42 predicts for natural gas; will use the measured EF to be conservative.

PM factor: Option 1: EF based on NSPS limit (40 CFR 60.92, Subpart I) and actual test data as follows (RF0, diesel, natural gas):
EF = (gr/dscf) / (7000 gr/lb) * (dscf/min) * (60 min/hr) / (tph HMA)
NSPS PM Limit = 0.04 gr/dscf (tested at 0.002 gr/dscf counting front half during May 2017 test)
stack flow during test = 30600 dscf/min measured during May 2009 test
production during test = 116 ton/hr HMA measured during May 2009 test
NSPS-based emission factor = 0.090 lb/ton HMA, assumes baghouse is needed to comply
Note: NSPS limit is more strict than FARR PM limit of 0.1 gr/dscf, so NSPS will be used for PTE
Option 2: EF Based on AP42, 3/04, Table 11.1-3, PM=0.014 lb/ton for RF0, diesel and natural gas
Measured and AP42 predicted emissions are lexss than the NSPS limit; will use NSPS based EF to be conservative

PM10/PM2.5 factor: AP-42 3/04, Table 11.1-3 -- fabric filter controlled filterable PM10 for RF0, diesel, natural gas (includes condensible particulate)
filterable = 0.0039 organic = 0.0074 inorganic = 0.012 PM10 EF = 0.0233
Note: assumes fabric filter control is required for NSPS, so will use controlled factors for PM10
Emission factor does include condensible PM

SO2 factor: Option 1: EF based on FARR combustion stack SO2 limit (40 CFR 49.129(d)(1)) = 500 ppm (dry volume basis at 7% O2) for RF0 oil, diesel, natural gas
EF = (ppm limit) * (1.66E-7 lb/dscf / ppm) * (21-O2test) / (21-O2limit) * (dscf test/min) * (60 min/hr) / (tph HMA)
SO2 limit = 500 ppm @ 7%O2 MW of SO2= 64
measured flow rate = 30600 dscf/min measured during May 2017 test
O2 during test = 16.7 % measured during May 2017 test
FARR limit O2 = 7 %
production during test = 116 ton/hr HMA
emission factor = 0.404 lb/ton HMA
Note: FARR process SO2 500 ppm limit is not corrected for O2, so in this case is less strict than the combustion limit
Note: For RFO: AP-42 3/04, Table 11.1-7 (0.058 lb/ton) results in lower emissions, but assumed fuel S content is not listed
Note: For #2 diesel: AP-42 3/04, Table 11.1-7 (0.011 lb/ton) results in lower emissions
Note: For natural gas: AP-42 3/04, Table 11.1-7 (0.0034 lb/ton) results in lower emissions
Option 2: EF based on FARR fuel % sulfur limit (40 CFR 49.130(d)(4)) used oil and #2 diesel are %S by wt
For used oil: EF = (%Slimit / 100)*(max BTU/hr)/(140000 Btu/gal fuel)*(gal fuel/7.88 lb)*(2 lb SO2 per lb S)/(max tph HMA)-(SO2 staying in HMA)
For #2 diesel: EF = (%Slimit / 100)*(max BTU/hr)/(140000 Btu/gal fuel)(gal fuel/7.05 lb)*(2 lb SO2 per lb S)/(max tph HMA)*(SO2 fraction not in HMA)
For nat gas: EF = (ppmSlimit * 32 / 385.1E6)*(max mmBTU/hr)/(1020 Btu/cf fuel)*(2 lb SO2 per lb S)/(max tph HMA)*(1 - SO2 staying in HMA)
nat gas conversion: (ppm S) * (MW) / (385.1E6) = lb S / cf nat gas

| | used oil | diesel | nat gas | |
|---|---|---|---|---|
| FARR S limit = | 2 | 0.5 | 400 | % by weight (nat gas is standard ppmv) |
| max burner firing rate = | 7.56E+07 | 7.56E+07 | 7.56E+07 | BTU/hr |
| fuel heating value = | 1.40E+05 | 1.40E+05 | 1020 | BTU/gal (nat gas is BTU/cf) |
| fuel weight = | 7.88 | 7.05 | | lb/gal |
| max HMA production rate = | 150 | 150 | 150 | ton/hr HMA |

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

| | | | | |
|---|---|---|---|---|
| SO2 staying in HMA = | 0.1 | 50 | 50 | % not to exceed 0.1 lb/ton (per AP-42 3/2004, Table 11.1-7) |
| emission factor = | 1.035 | 0.127 | 0.016 | lb/ton HMA |

Option 3: EF Based on AP42, 3/04, Table 11.1-7 for RF0, diesel and natural gas

For RFO: SO2 = 0.058 lb/ton - so actual emission should be lower, but assumed fuel S content is not listed

For #2 diesel: SO2 = 0.011 lb/ton - so actual emissions should be lower

For natural gas: SO2 = 0.0034 lb/ton - so actual emissions should be lower

RFO SO2 PTE EF will be based on FARR 500 ppm SO2 combustion stack limit because it is more strict than FARR 2% fuel sulfur limit.

#2 diesel SO2 PTE EF will be based on FARR 0.5% sulfur limit because it is more strict than FARR 500 ppm SO2 combustion stack limit.

Natural gas SO2 PTE EF will be based on FARR 400 ppmv sulfur limit because it is more strict than FARR 500 ppm SO2 combustion stack limit.

VOC factor: For RFO, diesel, natural gas: AP-42 3/04, Table 11.1-8, uncontrolled

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#2 Storage Tanks**

Description: Three tanks are used to store petroleum liquids
(Tank 1) Storage of liquid asphalt
(Tank 2) Storage of liquid asphalt
(Tank 3) Storage of #2 diesel in portable tank trailer which supplies on-site vehicles

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Liquid: | Asphalt | Asphalt | RFO/Diesel | |
| Control: | none | none | none | |
| Capacity: | 20,000 | 10,000 | 10,000 | gallons (EPA estimate for Tanks No. 2 and 3) |
| Operation: | 12,266,044 | 3,066,511 | 2,325,780 | |
| TOC Emissions | 111.48 | 35.30 | 13.92 | lbs/yr TOC - value based upon Tanks Program 4.0.9d and adjusted for EPA-calculated throughput |

**Potential to Emit, (tons per year)**

| | Tank 1 - Asphalt | | Tank 2 - Asphalt | | Tank 3 - #2 diesel | | Total |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | 0.097 | 5.4E-03 | | | | | 0.005 |
| Lead | | | | | | | |
| NOx | | | | | | | |
| PM | | | | | | | |
| PM10 | | | | | | | |
| PM2.5 | | | | | | | |
| SO2 | | | | | | | |
| VOC | 1 | 5.57E-02 | 1 | 1.77E-02 | 1 | 7.0E-03 | 0.080 |

**Estimation Explanations**

Emission factors (EF) units in table are fraction (%/100) of Total Organic Compound (TOC) emissions from computer program

TOC Emissions: Tanks Computer Program (see AP-42, 7.1 (11/06)), lbs/yr; see application for computer program input details
EPA adjusted Tanks Computer Program output to reflect EPA-calculated annual liquid throughput as reflected in table below:

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Modeled Operation: | 12,266,044 | 3,066,511 | 2,325,780 | gallons per year throughput. Applicant modeled emissions for Tank No. 1 while EPA modeled emissions for Tanks No. 2 and 3. |
| PTE Operation: | 12,266,044 | 3,066,511 | 2,325,780 | gallons per year throughput as calculated by EPA and presented below |
| Ratio of PTE Operation to Modeled Operation: | 1.00 | 1.00 | 1.00 | |
| Modeled TOC Emissions: | 111.48 | 35.30 | 13.92 | lbs/yr TOC - calculated with Tanks Program 4.0.9d |
| PTE TOC Emissions: | 111.48 | 35.30 | 13.92 | lbs/yr TOC - calculated by adjusting applicant's modeled value for Tank No. 1 by ratio of PTE/modeled annual tank throughput |

VOC factor: For tank 1, EF from AP-42, 3/04, table 11.1-16
For tanks 2, 3, 4 and 5, VOC = TOC

CO factor: AP-42, 3/04, Page 11.1-9; multiply factor by TOC emissions

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#3 Aggregate Handling & Screening**

Description: Three transfers of aggregate and three transfers of recycled asphlat paving (RAP) material from storage pile to drum dryer
a. Aggregate transfer to aggregate bins
b. Aggregate transfer from bins to conveyor belt
c. Aggregate transfer from conveyor to drum mixer
d. RAP transfer to RAP bin
e. RAP transfer from RAP bin to conveyor
f. RAP transfer from conveyor to drum mixer
g. scalping screen

| | | |
|---|---|---|
| Control: | none | |
| Capacity: | 150 | tons/hour HMA (worst case assumes all material runs through 3 transfers) |
| | 75 | tph RAP (assumes 50% max) |
| Operation: | 8760 | hours/year |

**Potential to Emit, (tons per year)**

| | 6 Aggregate transfers | | 3 RAP transfers | | Scalping Screen | | Total |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE, TPY |
| CO | | | | | | | 0.0 |
| Lead | | | | | | | 0.0 |
| NOx | | | | | | | 0.0 |
| PM | 0.0028 | 11.2 | | 0.0 | 0.0250 | 32.9 | 44.0 |
| PM10 | 0.0013 | 5.3 | | 0.0 | 0.0087 | 11.4 | 16.7 |
| PM2.5 | 0.0002 | 0.8 | | 0.0 | 0.0087 | 11.4 | 12.2 |
| SO2 | | | | | | | 0.0 |
| VOC | | | | | | | 0.0 |

**Estimation Explanations**

Emission factor (EF) units are lb/ton of aggregate handled/screened

PM factor: For transfers, AP-42, 11/06, Section 13.2.4, Equation 1 for each drop operation (worst case assumes all material is aggregate passing through 6 transfers)
Emission factor=k(0.0032)(U/5)^1.3/(M/2)^1.4

| | | |
|---|---|---|
| U, mean wind speed: | 8.9 | mph, NOAA data for Spokane found at http://www.ncdc.noaa.gov/oa/climate/online/ccd/wndspd.txt |
| M, material moisture content: | 3 | %, Emission Inventory Improvement Program, Vol II, Chapter 3, page 3.2-3, July 1996 (range = 3-7%) |
| k, particle size multiplier: | 0.74 | for <30 microns particle size |

PM10 factor: For transfers, same as for PM emission factor, except that

| | | |
|---|---|---|
| k, particle size multiplier: | 0.35 | for <10 microns particle size |

PM10 factor: For transfers, same as for PM emission factor, except that

| | | |
|---|---|---|
| k, particle size multiplier: | 0.053 | for <10 microns particle size |

Emissions are multiplied by 6 to account for all six transfers

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#4 Silo Filling**

Description: Loading of hot-mix asphalt mix (HMA mix) into Silo
Control: Reinjection of gases to dryer
Capacity: 150 tons/hour HMA
Operation: 8760 hours/year

**Potential to Emit, (tons per year)**

| | Silo filling | |
|---|---|---|
| | EF | PTE TPY |
| CO | 1.18E-03 | 0.78 |
| Lead | | 0 |
| NOx | | 0 |
| PM | 3.32E-04 | 0.22 |
| PM10 | 5.86E-04 | 0.38 |
| PM2.5 | 5.86E-04 | 0.38 |
| SO2 | | 0 |
| VOC | 1.22E-02 | 8.01 |

**Estimation Explanations**

Emission factor (EF) units are lb/ton of HMA handled
Predictive Emission Equations used to calculate Emission Factors from AP-42 3/04, Table 11.1-14

CO factor: $CO\ EF = 0.00488(-V)e^{((0.0251)(T+460)-20.43)}$
PM factor: PM EF = 0.000332 lb/ton HMA (assumes only fraction captured by RM5 counts as PM)
PM10 factor: $PM10\ EF = 0.000332+0.00105(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM10 and that no organic PM appears in the impingers of sampling train)
PM2.5 factor: $PM10\ EF = 0.000332+0.00105(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM2.5 and that no organic PM appears in the impingers of sampling train)
VOC factor: $VOC\ EF = 0.0504(-V)e^{((0.0251)(T+460)-20.43)}$ (100% of TOC measured as propane, per AP42, Table 11.1-16)
V = asphalt volatility = -0.5 AP-42 default value
T = HMA mix temperature = 325 $^{O}$F, AP-42 default value

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#5 Truck Loading & Fumes**
Description: a Load-out of hot-mix asphalt mix (HMA mix) from silo to asphalt trucks
b Fumes from HMA in loaded asphalt trucks while in plant
Control: none
Capacity: 150 tons/hour HMA
Operation: 8760 hours/year

**Potential to Emit, (tons per year)**

| | Silo loadout | | Truck fumes | | Total |
|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | 1.35E-03 | 0.89 | 3.52E-04 | 0.23 | 1.12 |
| Lead | | | | | |
| NOx | | | | | |
| PM | 1.81E-04 | 0.12 | | | 0.12 |
| PM10 | 5.22E-04 | 0.34 | | | 0.34 |
| PM10 | 5.22E-04 | 0.34 | | | 0.34 |
| SO2 | | | | | |
| VOC | 3.91E-03 | 2.57 | 1.03E-03 | 0.68 | 3.25 |

**Estimation Explanations**
Emission factor (EF) units are lb/ton of HMA handled

a Silo Loadout
Predictive Emission Equations used to calculate Emission Factors from AP-42 3/04, Table 11.1-14

CO factor: $0.00558(-V)e^{((0.0251)(T+460)-20.43)}$
PM factor: PM EF = 0.000181 lb/ton HMA (assumes only fraction captured by RM5 counts as PM)
PM10 factor: $0.000181+0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM10 and that no organic PM appears in the impingers of sampling train)
PM2.5 factor: $0.000181+0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM2.5 and that no organic PM appears in the impingers of sampling train)
VOC factor: $0.94[0.0172(-V)e^{((0.0251)(T+460)-20.43)}]$ (94% of TOC measured as propane, per AP42, Table 11.1-16)

TOC = $0.0172(-V)e^{((0.0251)(T+460)-20.43)}$ AP42, Table 11.1-16
V = asphalt volatility = -0.5 AP-42 default value
T = HMA mix temperature = 325 $^{O}$F, AP-42 default value

b Truck-load emissions (while in plant for approximately 8 minutes)
Emission factors from AP42, 11.1.2.5
TOC = 0.0011 lb/ton
CO factor: (32% of TOC measured as propane)
VOC factor: (94% of TOC measured as propane per AP42, Table 11.1-16)

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#6 Vehicle Traffic**

Description: Road dust caused by vehicle traffic
a. Truck for loading and delivery of HMA product:
b. Loader for delivering aggregate and RAP to drum dryer loading bins:
c. Truck for delivering gravel and RAP to plant
d. Asphalt truck delivering asphalt to plant

| | | | |
|---|---|---|---|
| Control: | none | | |
| Capacity: | 150 | tons per hour HMA (plant) | (assume 5% is asphalt oil) |
| | 1314000 | tons per year HMA | |
| | 1751 | gal/hr liquid asphalt | (11.67 gal/tonHMA from application) |
| | 15,332,555 | gal/yr liquid asphalt | (from tank sheet) |
| | 65,700 | ton/yr liquid asphalt | (8.57 lb/gal from AP42) |
| | 2,325,780 | gal/yr diesel | (1.77 gal/tonHMA from application) |
| | 9,164 | tons/yr diesel | (7.88 lbs/gal from application) |
| Operation: | 8760 | hours/year | |

**Potential to Emit, (tons per year)**

| | HMA Truck PTE TPY | Loaders PTE TPY | Oil Truck PTE TPY | Fuel Truck PTE TPY | Total PTE TPY |
|---|---|---|---|---|---|
| CO | | | | | |
| Lead | | | | | |
| NOx | | | | | |
| PM | 53.25 | 131.98 | 2.03 | 0.38 | 187.6 |
| PM10 | 13.57 | 36.37 | 0.52 | 0.10 | 50.6 |
| PM2.5 | 1.36 | 3.64 | 0.05 | 0.01 | 5.1 |
| SO2 | | | | | |
| VOC | | | | | |

**Estimation Explanations**

Emission factor (EF) units are lb/vehicle mile traveled
Assumes that 100% of trip distance is on unpaved surface for all vehicles
Liquid asphalt/fuel delivery truck size = 8168 gallons
Spokane data from: http://www.nrcc.cornell.edu/ccd/prge0198.html
Predictive Emission Equations used to calculate Emission Factors from AP-42 12/03, Section 13.2.2, Equation 1a and 2
E = EF x VMT / 2000
PM EF: k*(s/12)^a*(W/3)^b*(1-P/N), from 11/06 AP-42 13.2.2, Equation 1a and 2, see below for parameters
PM10 factor: Same equation as for PM emission factor except some different parameters, see below

Road Data:

| | PM | PM10 | |
|---|---|---|---|
| empirical constant (k) = | 4.9 | 1.5 | PM data for particles <30 microns PM2.5 = 0.15 |
| material handling silt content (s), % = | 7.1 | 7.1 | silt from AP-42 Table 13.2.2-1 (sand and gravel - for loader) |
| road surface silt content (s), % = | 4.8 | 4.8 | silt from AP-42 Table 13.2.2-1 (sand and gravel - for roads) |
| empirical constant (a) = | 0.7 | 0.9 | PM data for particles <30 microns |
| empirical constant (b) = | 0.45 | 0.45 | PM data for particles <30 microns |

Vehicle Data: (from company except asphalt delivery truck wt from EPA experience)

| | HMA Truck | Loader | Oil Truck | Fuel Truck |
|---|---|---|---|---|
| empty weight, tons = | 18.1 | 26.0 | 10.0 | 10.0 |
| loaded weight, tons = | 43.1 | 32.5 | 40.0 | 30.0 |
| mean vehicle weight (W), tons = | 30.6 | 29.3 | 25.0 | 20.0 |
| tons per trip, tons = | 25.0 | 6.5 | 30.0 | 20.0 |
| trips per day = | 144.0 | 553.8 | 6.0 | 0.0 |
| trips per year = | 52560 | 202154 | 2190 | 458 |
| round trip distance, miles = | 0.4 | 0.2 | 0.4 | 0.4 |
| unpaved VMT, miles/year = | 21024 | 40431 | 876 | 183 |

Weather Data:

| | | |
|---|---|---|
| # of days with > 0.01 inch of precipitation (P) = | 113 | For Spokane, WA: http://www.nrcc.cornell.edu/ccd/prge0198.html |
| # of days in averaging period (N) = | 365 | based on need for annual PTE |

Emission factors:

| | HMA Truck | Loader - Stockpile Area | Oil Truck | Fuel Truck |
|---|---|---|---|---|
| PM EF, lb/VMT = | 5.07 | 6.53 | 4.63 | 4.18 |
| PM10 EF, lb/VMT = | 1.29 | 1.80 | 1.18 | 1.07 |
| PM2.5. lb/VMT= | 0.13 | 0.18 | 0.12 | 0.11 |

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#7 Wind Erosion**

| | | |
|---|---|---|
| Description: | Wind erosion of all exposed areas including piles | |
| Control: | none | |
| Capacity: | 150 | tons/hour HMA |
| Operation: | 8760 | hours/year |
| | 1314000 | tons/yr (tons/hr x hours/yr) |
| | 25269.2308 | tons/pile (assumes a 1 week supply is available on site so divide total yearly amount by 52) |
| | 481318.681 | ft3 per pile, assumes aggregate density is 105 lb/cu ft (Weights of Materials, page 393) |
| Pile height: | 50 | feet, assumed |
| Pile width: | 200 | feet, assumed |
| Pile length: | 48.1 | feet |
| Pile Footprint: | 9,626 | ft2 |
| | 0.22 | acres, assumes 43560 ft2/acre |
| Open Area: | 2.00 | acres, assumed conservative sized (disturbed) site - unvegetated area |

**Potential to Emit, (tons per year)**

| | Pile Wind Erosion | | Open Area Wind Erosion | | Total |
|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | | | | | |
| Lead | | | | | |
| NOx | | | | | |
| PM | 0.35 | 0.08 | 0.35 | 0.70 | 0.78 |
| PM10 | 0.16 | 0.04 | 0.16 | 0.33 | 0.37 |
| PM2.5 | 0.01 | 0.02 | 0.01 | 0.00 | 0.02 |
| SO2 | | | | | |
| VOC | | | | | |

**Estimation Explanations**

Emission factor (EF) units are tons/acre per year

Stockpile size calculated based on maximum capacity, operating 8760 hr/yr

PM factor: AP-42, 10/98, Section 11.9, Table 11.9-4 for wind erosion of exposed areas

PM10 factor: Engineering estimate - 47% of PM factor from ratio of transfer particle size multipliers (0.35/0.74) in AP-42 1/95 13.2.4

PM2.5 factor: Engineering estimate - 7.2% of PM factor from ratio of transfer particle size multipliers (0.053/0.74) in AP-42 1/95 13.2.4

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#1 Drum Dryer**
Description: Hot Mix Asphalt Plant Drum Dryer - parallel flow drum mix design
Control: Baghouse
Fuel: RF0, #2 diesel, propane or natural gas (RF0, reprocessed fuel oil is called waste oil by AP-42)
Capacity: 150 tph hot mix asphalt Burner: 75.6 mmBtu/hr capacity
Operation: 8760 hours/year
Fuel: 4,423,800 gallons per year of liquid fuel (waste oil/reprocessed fuel oil, distallate and residual fuel oil)

**Potential to Emit, (tons per year)**

| **Inorganics** | RF0 | | #2 diesel | | Natural Gas | | Max |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| Antimony Compounds | 1.80E-07 | 1.18E-04 | 1.80E-07 | 1.18E-04 | 1.80E-07 | 1.18E-04 | 1.18E-04 |
| Arsenic Compounds (incl arsine) | 5.60E-07 | 3.68E-04 | 5.60E-07 | 3.68E-04 | 5.60E-07 | 3.68E-04 | 3.68E-04 |
| Beryllium Compounds | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cadmium Compounds | 4.10E-07 | 2.69E-04 | 4.10E-07 | 2.69E-04 | 4.10E-07 | 2.69E-04 | 2.69E-04 |
| Chromium Compounds (incl hexavalent) | 5.50E-06 | 3.61E-03 | 5.50E-06 | 3.61E-03 | 5.50E-06 | 3.61E-03 | 3.61E-03 |
| Cobalt Compounds | 2.60E-08 | 1.71E-05 | 2.60E-08 | 1.71E-05 | 2.60E-08 | 1.71E-05 | 1.71E-05 |
| Lead Compounds (not elemental lead) | 1.50E-05 | 9.86E-03 | 1.50E-05 | 9.86E-03 | 6.20E-07 | 4.07E-04 | 9.86E-03 |
| Manganese Compounds | 7.70E-06 | 5.06E-03 | 7.70E-06 | 5.06E-03 | 7.70E-06 | 5.06E-03 | 5.06E-03 |
| Mercury Compounds | 2.60E-06 | 1.71E-03 | 2.60E-06 | 1.71E-03 | 2.40E-07 | 1.58E-04 | 1.71E-03 |
| Nickel Compounds | 6.30E-05 | 4.14E-02 | 6.30E-05 | 4.14E-02 | 6.30E-05 | 4.14E-02 | 4.14E-02 |
| Phophorus Compounds | 2.80E-05 | 1.84E-02 | 2.80E-05 | 1.84E-02 | 2.80E-05 | 1.84E-02 | 1.84E-02 |
| Selenium Compounds | 3.50E-07 | 2.30E-04 | 3.50E-07 | 2.30E-04 | 3.50E-07 | 2.30E-04 | 2.30E-04 |
| **Organics** | | | | | | | |
| Acetaldehyde | 1.30E-03 | 8.54E-01 | - | | - | | 8.54E-01 |
| Acrolein | 2.60E-05 | 1.71E-02 | - | | - | | 1.71E-02 |
| Benzene | 3.90E-04 | 2.56E-01 | 3.90E-04 | 2.56E-01 | 3.90E-04 | 2.56E-01 | 2.56E-01 |
| Bromomethane (methyl bromide) | - | | - | | - | | |
| 1,3-Butadiene | - | | - | | - | | |
| Carbon Disulfide | - | | - | | - | | |
| Chloroethane (ethyl chloride) | - | | - | | - | | |
| Chloromethane (methyl chloride) | - | | - | | - | | |
| Dichlorobenzene | - | | - | | - | | |
| Cumene | - | | - | | - | | |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | 2.10E-13 | 1.38E-10 | 2.10E-13 | 1.38E-10 | | 0.00E+00 | 1.38E-10 |
| Ethyl Benzene | 2.40E-04 | 1.58E-01 | 2.40E-04 | 1.58E-01 | 2.40E-04 | 1.58E-01 | 1.58E-01 |
| Formaldehyde | 3.10E-03 | 2.04E+00 | 3.10E-03 | 2.04E+00 | 3.10E-03 | 2.04E+00 | 2.04E+00 |
| Furans (all PCDF) | 4.00E-11 | 2.63E-08 | 4.00E-11 | 2.63E-08 | | 0.00E+00 | 2.63E-08 |
| Hexane (includes n-Hexane) | 9.20E-04 | 6.04E-01 | 9.20E-04 | 6.04E-01 | 9.20E-04 | 6.04E-01 | 6.04E-01 |
| Hydrochloric Acid (hydrogen chloride) | 2.10E-04 | 1.38E-01 | - | | - | | 1.38E-01 |
| Isooctane (2,2,4-trimethylpentane) | 4.00E-05 | 2.63E-02 | 4.00E-05 | 2.63E-02 | 4.00E-05 | 2.63E-02 | 2.63E-02 |
| Methyl Chloride (chloromethane) | - | | - | | - | | |
| Methyl Chloroform (1,1,1-trichloroethane) | 4.80E-05 | 3.15E-02 | 4.80E-05 | 3.15E-02 | 4.80E-05 | 3.15E-02 | 3.15E-02 |
| Methyl tert-Butyl Ether (MTBE) | - | | - | | - | | |
| Naphthalene (also a POM) | 6.50E-04 | 4.27E-01 | 8.80E-09 | 5.78E-06 | 9.00E-05 | 5.91E-02 | 4.27E-01 |
| Phenol | - | | - | | - | | |
| Polycyclic Organic Matter* (incl naphthalene) | 8.85E-04 | 5.81E-01 | 8.85E-04 | 5.81E-01 | 1.87E-04 | 1.23E-01 | 5.81E-01 |
| Propionaldehyde | 1.30E-04 | 8.54E-02 | - | | - | | 8.54E-02 |
| Quinone | 1.60E-04 | 1.05E-01 | - | | - | | 1.05E-01 |
| Styrene | - | | - | | - | | |
| Tetrachloroethane | - | | - | | - | | |
| Toluene | 2.90E-03 | 1.91E+00 | 2.90E-03 | 1.91E+00 | 1.50E-04 | 9.86E-02 | 1.91E+00 |
| Xylenes (inlc isomers and mixtures) | 2.00E-04 | 1.31E-01 | 2.00E-03 | 1.31E+00 | 2.00E-04 | 1.31E-01 | 1.31E+00 |
| **HAP Total** | | 7.01E+00 | | 6.99E+00 | | 3.54E+00 | 7.01E+00 |

| ***Polycyclic Organic Matter** | RF0 | | #2 diesel | | Natural Gas | |
|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY |
| Acenaphthene | 1.40E-06 | 9.20E-04 | 1.40E-06 | 9.20E-04 | 1.40E-06 | 9.20E-04 |
| Acenaphthylene | 2.20E-05 | 1.45E-02 | 2.20E-05 | 1.45E-02 | 8.60E-06 | 5.65E-03 |
| Anthracene | 3.10E-06 | 2.04E-03 | 3.10E-06 | 2.04E-03 | 2.20E-07 | 1.45E-04 |
| Benzo(a)anthracene | 2.10E-07 | 1.38E-04 | 2.10E-07 | 1.38E-04 | 2.10E-07 | 1.38E-04 |
| Benzo(b)fluoranthene | 1.00E-07 | 6.57E-05 | 1.00E-07 | 6.57E-05 | 1.00E-07 | 6.57E-05 |
| Benzo(k)fluoranthene | 4.10E-08 | 2.69E-05 | 4.10E-08 | 2.69E-05 | 4.10E-08 | 2.69E-05 |
| Benzo(g,h,i)perylene | 4.00E-08 | 2.63E-05 | 4.00E-08 | 2.63E-05 | 4.00E-08 | 2.63E-05 |
| Benzo(a)pyrene | 9.80E-09 | 6.44E-06 | 9.80E-09 | 6.44E-06 | 9.80E-09 | 6.44E-06 |
| Benzo(e)pyrene | 1.10E-07 | 7.23E-05 | 1.10E-07 | 7.23E-05 | 1.10E-07 | 7.23E-05 |
| Chrysene | 1.80E-07 | 1.18E-04 | 1.80E-07 | 1.18E-04 | 1.80E-07 | 1.18E-04 |
| Dioxins (Total PCDD; incl 2,3,7,8 TCDD) | 7.90E-11 | 5.19E-08 | 2.10E-13 | 1.38E-10 | - | |
| Fluoranthene | 6.10E-07 | 4.01E-04 | 6.10E-07 | 4.01E-04 | 6.10E-07 | 4.01E-04 |
| Fluorene | 1.10E-05 | 7.23E-03 | 1.10E-05 | 7.23E-03 | 3.80E-06 | 2.50E-03 |
| Furans (all PCDF) | 4.00E-11 | 2.63E-08 | 4.00E-11 | 2.63E-08 | - | |
| Indeno(1,2,3-cd)pyrene | 7.00E-09 | 4.60E-06 | 7.00E-09 | 4.60E-06 | 7.00E-09 | 4.60E-06 |
| 2-Methylnaphthalene | 1.70E-04 | 1.12E-01 | 1.70E-04 | 1.12E-01 | 7.40E-05 | 4.86E-02 |
| Naphthalene (also individual HAP) | 6.50E-04 | 4.27E-01 | 6.50E-04 | 4.27E-01 | 9.00E-05 | 5.91E-02 |
| Perylene | 8.80E-09 | 5.78E-06 | 8.80E-09 | 5.78E-06 | 8.80E-09 | 5.78E-06 |
| Phenanthrene | 2.30E-05 | 1.51E-02 | 2.30E-05 | 1.51E-02 | 7.60E-06 | 4.99E-03 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pyrene | 3.00E-06 | 1.97E-03 | 3.00E-06 | 1.97E-03 | 5.40E-07 | 3.55E-04 |
| **POM Subtotal** | 8.85E-04 | 5.81E-01 | 8.85E-04 | 5.81E-01 | 1.87E-04 | 1.23E-01 |

**Estimation Explanations**

Emission factor (EF) units are lb/ton HMA

Worst-case PTE is the higher emitting of the fuel options taking into consideration the most stringent emission limits that exist

To avoid double-counting, "HAP Total" does not count naphthalene, dioxin (HAP) or furans separately because they are accounted for in "POM Subtotal"

| | |
|---|---|
| Chromium EF: | Chromium EF is assumed to included separately reported hexavalent chromium EF in AP-42 |
| Hydrogen chloride EF: | AP-42, Table 11.1-8 for RF0 |
| All other inorganics EF: | AP-42, 3/04, Table 11.1-12 for fuel oil and RF0 with fabric filter |
| Dioxin EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter - all dioxins are POM; only 2,3,7,8 TCDD is a HAP |
| Furans EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter - total of all furans (is a HAP & POM) |
| Naphthalene EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter (is a HAP & POM) |
| POM EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter (includes naphthalene, dioxin & furans) |
| All other organics EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter |

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#2 Storage Tanks**
Description: Three tanks are used to store petroleum liquids
(Tank 1) Storage of liquid asphalt
(Tank 2) Storage of liquid asphalt in a portable tank trailer
(Tank 3) Storage of #2 diesel in portable tank trailer which supplies generator

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Liquid: | Asphalt | Asphalt | #2 Diesel | |
| Control: | none | none | none | |
| Capacity: | 20,000 | 10,000 | 10,000 | gallons (EPA estimate for Tanks No. 2 and 3) |
| Operation: | 12,266,044 | 3,066,511 | 2,325,780 | EPA-calculated gallons per year throughput |
| TOC Emissions | 111.48 | 35.30 | 13.92 | lbs/yr TOC - value based upon Tanks Program 4.0.9d and adjusted for EPA-calculated throughput |

**Potential to Emit, (tons per year)**

| | (Tank 1) Asphalt | | (Tank 2) RFO | | (Tank 3) #2 diesel | | Total |
|---|---|---|---|---|---|---|---|
| **Organics** | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| Acetaldehyde | | | | | | | |
| Acrolein | | | | | | | |
| Benzene | 0.032 | 1.78E-03 | | 0.00E+00 | | 0.00E+00 | 1.78E-03 |
| Bromomethane (methyl bromide) | 0.0049 | 2.73E-04 | | 0.00E+00 | | 0.00E+00 | 2.73E-04 |
| 1,3-Butadiene | | | | | | | |
| Carbon Disulfide | 0.016 | 8.92E-04 | | 0.00E+00 | | 0.00E+00 | 8.92E-04 |
| Chloroethane (ethyl chloride) | 0.004 | 2.23E-04 | | 0.00E+00 | | 0.00E+00 | 2.23E-04 |
| Chloromethane (methyl chloride) | 0.023 | 1.28E-03 | | 0.00E+00 | | 0.00E+00 | 1.28E-03 |
| Cumene | | | | | | | |
| Dichlorobenzene | | | | | | | |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | | | | | | | |
| Ethyl Benzene | 0.038 | 2.12E-03 | | 0.00E+00 | | 0.00E+00 | 2.12E-03 |
| Formaldehyde | 0.69 | 3.85E-02 | | 0.00E+00 | | 0.00E+00 | 3.85E-02 |
| Furans (all PCDF) | | | | | | | |
| Hexane (incl n-Hexane) | 0.1 | 5.57E-03 | | 0.00E+00 | | 0.00E+00 | 5.57E-03 |
| Hydrochloric Acid (hydrogen chloride) | | | | | | | |
| Isooctane (2,2,4-trimethylpentane) | 0.00031 | 1.73E-05 | | 0.00E+00 | | 0.00E+00 | 1.73E-05 |
| Methyl Chloride (chloromethane) | 0.00027 | 1.50E-05 | | 0.00E+00 | | 0.00E+00 | 1.50E-05 |
| Methyl Chloroform (1,1,1-trichloroethane) | | | | | | | |
| Methyl tert-Butyl Ether (MTBE) | | | | | | | |
| Naphthalene[1] (also a POM) | | | | | | | |
| Phenol | | | | | | | |
| Polycyclic Organic Matter* (incl naphthalene) | | | | | | | |
| Propionaldehyde | | | | | | | |
| Quinone | | | | | | | |
| Styrene | 0.0054 | 3.01E-04 | | 0.00E+00 | | 0.00E+00 | 3.01E-04 |
| Tetrachloroethane | | | | | | | |
| Toluene | 0.062 | 3.46E-03 | | 0.00E+00 | | 0.00E+00 | 3.46E-03 |
| Xylene (incl isomers and mixtures) | 0.257 | 1.43E-02 | | 0.00E+00 | | 0.00E+00 | 1.43E-02 |
| **HAP Total** | | 6.87E-02 | | 0.00E+00 | | 0.00E+00 | 6.87E-02 |

**Estimation Explanations**
Emission factor (EF) units are % of organic PM for POM and phenol and fraction (%/100) of TOC for all other organics
TOC Emissions: Tanks Computer Program (see AP-42, 7.1 (11/06)), lbs/yr; see application for computer program input details
EPA adjusted Tanks Computer Program output to reflect EPA-calculated annual liquid throughput as reflected in table below:

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Modeled Operation: | 12,266,044 | 3,066,511 | 2,325,780 | gallons per year throughput. Applicant modeled emissions for Tank No. 1 while EPA modeled emissions for Tanks No. 2 and 3. |
| Operation: | 12,266,044 | 3,066,511 | 2,325,780 | gallons per year throughput as calculated by EPA and |
| Ratio of PTE Operation to Modeled Operation: | 1.00 | 1.00 | 1.00 | |
| TOC Emissions: | 111.48 | 35.30 | 13.92 | lbs/yr TOC - calculated with Tanks Program 4.0.9d |
| PTE TOC Emissions: | 111.48 | 35.30 | 13.92 | lbs/yr TOC - calculated by adjusting applicant's modeled value for Tank No. 1 by ratio of PTE/modeled annual tank throughput |

PTE Annual Asphalt Throughput:
Asphalt is assumed to be 5.5% wt of final HMA product and 8.57 lb/gal; so, gallons/ton of asphalt = (5.5/100)/(8.57 lb/gal)*(2000 lb/ton) = 12.84 gal/ton
Maximum HMA production = (400 tph)*(8760 hpy) = 3,504,000 tpy HMA; using (12.84 gpt)*(3,504,000 tpy) = 44,991,360 gal/yr liquid asphalt
PTE Annual Drum Dryer RFO Usage:[1]
Maximum RFO usage = (88,000,000 Btu/hr)*(gal RFO/140,000 Btu)*(8760 hpy) = 5,506,286 gal/yr RFO
PTE 820 kW and 205 kW Generators Tank #2 Diesel Usage:[2]
Maximum #2 diesel usage = (10,100,000 Btu/hr)*(gal #2 diesel/140,000 Btu)*(8760 hpy) = 631,971 gal/yr #2 diesel

To avoid double-counting, "HAP Total" does not count naphthalene separately because naphthalene is accounted for in "POM Subtotal"
Xylenes EF: m-, o- and p- isomers are individually listed as HAPs but for applicability purposes, are grouped as Xylenes
All other organics EF: AP-42, 3/04, Table 11.1-16 - (TOC) organic volatile-based speciation percentages
TOC = VOC/100% (AP-42, 3/04, Table 11.1-16)
For diesel and RFO, HAP data is not presented, because HAP emissions are expected to be very low

[1] Drum dryer firing capacity is 88 mmBtu/hr.
[2] Generators combined firing capacity is 10.10 mmBtu/hr.

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#4 Silo Filling**
Description: Loading of hot-mix asphalt mix (HMA mix) into silo
Control: Reinjection of gases to dryer
Capacity: 150 tons/hr HMA (from applicant)
Operation: 8,760 hours/yr

**Potential to Emit, (tons per year)**

| **Organics** | EF | PTE TPY |
|---|---|---|
| Acetaldehyde | | |
| Acrolein | | |
| Benzene | 0.032 | 2.56E-03 |
| Bromomethane (methyl bromide) | 0.0049 | 3.92E-04 |
| 1,3-Butadiene | | |
| Carbon Disulfide | 0.016 | 1.28E-03 |
| Chloroethane (ethyl chloride) | 0.004 | 3.20E-04 |
| Chloromethane (methyl chloride) | 0.023 | 1.84E-03 |
| Cumene | | |
| Dichlorobenzene | | |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | | |
| Ethyl Benzene | 0.038 | 3.04E-03 |
| Formaldehyde | 0.69 | 5.52E-02 |
| Furans (all PCDF) | | |
| Hexane (incl n-Hexane) | 0.1 | 8.01E-03 |
| Hydrochloric Acid (hydrogen chloride) | | |
| Isooctane (2,2,4-trimethylpentane) | 0.00031 | 2.48E-05 |
| Methyl Chloride (chloromethane) | 0.00027 | 2.16E-05 |
| Methyl Chloroform (1,1,1-trichloroethane) | | |
| Methyl tert-Butyl Ether (MTBE) | | |
| Naphthalene[1] (also a POM) | 1.82 | 3.04E-03 |
| Phenol | 1.18 | 1.97E-03 |
| Polycyclic Organic Matter* (incl naphthalene) | 11.41 | 1.90E-02 |
| Propionaldehyde | | |
| Quinone | | |
| Styrene | 0.0054 | 4.32E-04 |
| Tetrachloroethane | | |
| Toluene | 0.062 | 4.96E-03 |
| Xylene (incl isomers and mixtures) | 0.257 | 2.06E-02 |
| **HAP Total** | | 1.20E-01 |

| ***Polycyclic Organic Matter** | EF | PTE TPY |
|---|---|---|
| Acenaphthene | 0.47 | 7.84E-04 |
| Acenaphthylene | 0.014 | 2.34E-05 |
| Anthracene | 0.13 | 2.17E-04 |
| Benzo(a)athracene | 0.056 | 9.34E-05 |
| Benzo(e)pyrene | 0.0095 | 1.58E-05 |
| Chrysene | 0.21 | 3.50E-04 |
| Fluoranthene | 0.15 | 2.50E-04 |
| Fluorene | 1.01 | 1.68E-03 |
| 2-Methylnaphthalene | 5.27 | 8.79E-03 |
| Naphthalene (also individual HAP) | 1.82 | 3.04E-03 |
| Perylene | 0.03 | 5.00E-05 |
| Phenanthrene | 1.8 | 3.00E-03 |
| Pyrene | 0.44 | 7.34E-04 |
| **POM Subtotal** | 11.41 | 1.90E-02 |

**Estimation Explanations**
Emission factor (EF) units are % of organic PM for POM and phenol and % of TOC for all other organics
To avoid double-counting, "HAP Total" does not count naphthalene separately because naphthalene is accounted for in "POM Subtotal"
Predictive emission factors from AP-42 Tbl 11.1-14 for silo filling
Xylenes EF: m-, o- and p- isomers are individually listed as HAPs but for applicability purposes, are grouped as Xylenes
POM, naphthalene and phenol EF: AP-42, 3/04, Table 11.1-15 - organic particulate-based speciation percentages (%/100 x PM)
All other organics EF: AP-42, 3/04, Table 11.1-16 - (TOC) organic volatile-based speciation percentages (%/100 x TOC)

TOC EF: $0.0504(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded into silo

Organic PM EF: $0.00105(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded into silo

V = asphalt volatility = -0.5 AP-42 default value
T = HMA mix temperature = 325 $^{O}$F, AP-42 default value
TOC EF = 1.22E-02 lb/ton
TOC emissions = 8.01E+00 tons/year (TOC EF x annual capacity)
Organic PM EF = 2.54E-04 lb/ton
Organic PM emissions = 1.67E-01 tons/year (Organic PM EF x annual capacity)

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#5 Truck Loading & Fumes**
Description: a Load-out of hot-mix asphalt mix (HMA mix) from silo to asphalt trucks
b Fumes from loaded asphalt trucks while in plant
Control: none
Capacity: 150 tons/hr HMA (from applicant)
Operation: 8,760 hours/yr

**Potential to Emit, (tons per year)**

| Organics | Truck loading | | Truck-load fumes | | Total |
|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| Acetaldehyde | | | | | |
| Acrolein | | | | | |
| Benzene | 0.052 | 1.42E-03 | 0.052 | 3.76E-04 | 0.002 |
| Bromomethane (methyl bromide) | 0.0096 | 2.62E-04 | 0.0096 | 6.94E-05 | 0.000 |
| 1,3-Butadiene | | | | | |
| Carbon Disulfide | 0.013 | 3.55E-04 | 0.013 | 9.40E-05 | 0.000 |
| Chloroethane (ethyl chloride) | 0.00021 | 5.74E-06 | 0.00021 | 1.52E-06 | 0.000 |
| Chloromethane (methyl chloride) | 0.015 | 4.10E-04 | 0.015 | 1.08E-04 | 0.001 |
| Dichlorobenzene | | | | | |
| Cumene | 0.11 | 3.01E-03 | 0.11 | 7.95E-04 | 0.004 |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | | | | | |
| Ethyl Benzene | 0.28 | 7.65E-03 | 0.28 | 2.02E-03 | 0.010 |
| Formaldehyde | 0.088 | 2.40E-03 | 0.088 | 6.36E-04 | 0.003 |
| Furans (all PCDF) | | | | | |
| Hexane (incl n-Hexane) | 0.15 | 4.10E-03 | 0.15 | 1.08E-03 | 0.005 |
| Hydrochloric Acid (hydrogen chloride) | | | | | |
| Isooctane (2,2,4-trimethylpentane) | 0.0018 | 4.92E-05 | 0.0018 | 1.30E-05 | 0.000 |
| Methyl Chloride (chloromethane) | | | | | |
| Methyl Chloroform (1,1,1-trichloroethane) | | | | | |
| Methyl tert-Butyl Ether (MTBE) | | | | | |
| Naphthalene[1] (also a POM) | 1.25 | 2.80E-03 | 1.25 | 9.03E-03 | 0.012 |
| Phenol | 1.18 | 2.64E-03 | 1.18 | 8.53E-03 | 0.011 |
| Polycyclic Organic Matter* (incl naphthalene) | 5.93 | 1.33E-02 | 1.25 | 9.03E-03 | 0.022 |
| Propionaldehyde | | | | | |
| Quinone | | | | | |
| Styrene | 0.00732 | 2.00E-04 | 0.00732 | 5.29E-05 | 0.000 |
| Tetrachloroethane | 0.0077 | 2.10E-04 | 0.0077 | 5.56E-05 | 0.000 |
| Toluene | 0.21 | 5.74E-03 | 0.21 | 1.52E-03 | 0.007 |
| Xylene (incl isomers and mixtures) | 0.49 | 1.34E-02 | 0.49 | 3.54E-03 | 0.017 |
| **HAP Total** | | 5.51E-02 | | 2.79E-02 | 8.31E-02 |

| *Polycyclic Organic Matter | EF | PTE TPY | EF | PTE TPY |
|---|---|---|---|---|
| Acenaphthene | 0.26 | 5.82E-04 | | |
| Acenaphthylene | 0.028 | 6.27E-05 | | |
| Anthracene | 0.07 | 1.57E-04 | | |
| Benzo(a)athracene | 0.019 | 4.26E-05 | | |
| Benzo(b)fluoranthene | 0.0076 | 1.70E-05 | | |
| Benzo(k)fluoranthene | 0.0022 | 4.93E-06 | | |
| Benzo(g,h,I)perylene | 0.0019 | 4.26E-06 | | |
| Benzo(a)pyrene | 0.0023 | 5.15E-06 | | |
| Benzo(e)pyrene | 0.0078 | 1.75E-05 | | |
| Chrysene | 0.103 | 2.31E-04 | | |
| Dibenzo(a,h)anthracene | 0.00037 | 8.29E-07 | | |
| Fluoranthene | 0.05 | 1.12E-04 | | |
| Fluorene | 0.77 | 1.72E-03 | | |
| Indeno(1,2,3-cd)pyrene | 0.00047 | 1.05E-06 | | |
| 2-Methylnaphthalene | 2.38 | 5.33E-03 | | |
| Naphthalene (also individual HAP) | 1.25 | 2.80E-03 | 1.25 | 9.03E-03 |
| Perylene | 0.022 | 4.93E-05 | | |
| Phenanthrene | 0.81 | 1.81E-03 | | |
| Pyrene | 0.15 | 3.36E-04 | | |
| **POM Subtotal** | 5.93 | 1.33E-02 | 1.25 | 9.03E-03 |

**Estimation Explanations**

Emission factor (EF) units are % of organic PM for POM and phenol and % of TOC for all other organics

To avoid double-counting, "HAP Total" does not count naphthalene separately because naphthalene is accounted for in "POM Subtotal"

POM, naphthalene and phenol EF: AP-42, 3/04, Table 11.1-15 - organic particulate-based speciation percentages

All other organics EF: AP-42, 3/04, Table 11.1-16 - (TOC) organic volatile-based speciation percentages

Xylenes EF: m-, o- and p- isomers are individually listed as HAPs but for applicability purposes, are grouped as Xylenes

a. Truck loading predictive emission factors from AP-42 Tbl 11.1-14

TOC EF: $0.0172(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded out

Organic PM EF: $0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded out

V = asphalt volatility = -0.5 AP-42 default value

Emissions Inventory with No Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

| | | |
|---|---|---|
| T = HMA mix temperature = | 325 | $^{O}$F, AP-42 default value |
| TOC EF = | 4.16E-03 | lb/ton |
| TOC emissions = | 2.73E+00 | tons/year (TOC EF x annual capacity) |
| Organic PM EF = | 3.41E-04 | lb/ton |
| Organic PM emissions = | 2.24E-01 | tons/year (Organic PM EF x annual capacity) |

b. Truck-load emission factors from AP42, 11.1.2.5

| | | |
|---|---|---|
| TOC EF: | 1.10E-03 | lb/ton HMA hauled by trucks |
| TOC emissions = | 0.72 | tons/year (TCO EF x annual capacity) |

# Appendix B

## Emissions Inventory based on the Synthetic Minor Source Permit

Granite Construction Company
Hot Mix Asphalt Plant

Permit Analysis
Synthetic Minor Source Permit
R10TNSR01700

Emissions Inventory based on Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Summary of Facility Potential Criteria Air Pollutant Emissions

**Potential to Emit, (tons per year)**

**Point Sources**

| | EU 1 | EU 2 | EU 3 | EU 4 | EU 5 | EU 6 | EU 7 | |
|---|---|---|---|---|---|---|---|---|
| | Drum Dryer | Storage Tanks | Aggregate Handling | Silo Filling | Truck Loading & Fumes | Traffic | Wind Erosion | **Point Source Subtotals** |
| Carbon Monoxide (CO) | 19.50 | 0.00 | | 0.18 | | | | 19.68 |
| Lead (Pb) | 0.00 | 0.00 | | 0.00 | | | | 0.00 |
| Nitrogen Oxides (Nox) | 13.20 | 0.00 | | 0.00 | | | | 13.20 |
| Particulates (PM) | 13.57 | 0.00 | | 0.38 | | | | 13.95 |
| Fine Particulates (PM10) | 3.50 | 0.00 | | 0.09 | | | | 3.59 |
| Fine Particulates (PM2.5) | 3.50 | 0.00 | | 0.38 | | | | 3.88 |
| Sulfur Dioxide (SO2) | 21.28 | 0.00 | | 0.00 | | | | 21.28 |
| Volatile Organic Compounds (VOC) | 4.80 | 0.04 | | 1.83 | | | | 6.67 |

**Fugitive Sources**

| | EU 1 | EU 2 | EU 3 | EU 4 | EU 5 | EU 6 | EU 7 | |
|---|---|---|---|---|---|---|---|---|
| | Drum Dryer | Storage Tanks | Aggregate Handling | Silo Filling | Truck Loading & Fumes | Traffic | Wind Erosion | **Fugitive Source Subtotals** |
| Carbon Monoxide (CO) | | | 0.00 | | 0.25 | 0.00 | 0.00 | 0.25 |
| Lead (Pb) | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| Nitrogen Oxides (Nox) | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| Particulates (PM) | | | 10.06 | | 0.03 | 42.84 | 0.72 | 53.64 |
| Fine Particulates (PM10) | | | 3.82 | | 0.08 | 11.54 | 0.34 | 15.78 |
| Fine Particulates (PM2.5) | | | 2.79 | | 0.08 | 1.15 | 0.02 | 4.05 |
| Sulfur Dioxide (SO2) | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 |
| Volatile Organic Compounds (VOC) | | | 0.00 | | 0.75 | 0.00 | 0.00 | 0.75 |

**All Sources**

| | EU 1 | EU 2 | EU 3 | EU 4 | EU 5 | EU 6 | EU 7 | |
|---|---|---|---|---|---|---|---|---|
| | Drum Dryer | Storage Tanks | Aggregate Handling | Silo Filling | Truck Loading & Fumes | Traffic | Wind Erosion | **Plantwide Totals** |
| Carbon Monoxide (CO) | 19.50 | 0.00 | 0.00 | 0.18 | 0.25 | 0.00 | 0.00 | 19.93 |
| Lead (Pb) | 0.0023 | 0.0000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nitrogen Oxides (Nox) | 13.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.20 |
| Particulates (PM) | 13.57 | 0.00 | 10.06 | 0.38 | 0.03 | 42.84 | 0.72 | 67.59 |
| Fine Particulates (PM10) | 3.50 | 0.00 | 3.82 | 0.09 | 0.08 | 11.54 | 0.34 | 19.36 |
| Fine Particulates (PM2.5) | 3.50 | 0.00 | 2.79 | 0.38 | 0.08 | 1.15 | 0.02 | 7.93 |
| Sulfur Dioxide (SO2) | 21.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21.28 |
| Volatile Organic Compounds (VOC) | 4.80 | 0.04 | 0.00 | 1.83 | 0.75 | 0.00 | 0.00 | 7.42 |

**Plantwide PTE Limits**

| | | |
|---|---|---|
| Carbon Monoxide (CO) | 20 | tpy, based on emission limit in FARR Non-Title V permit |
| Lead (Pb) | N/A | |
| Nitrogen Oxides (Nox) | 13 | tpy, based on emission limit in FARR Non-Title V permit |
| Particulates (PM) | 68 | tpy, based on emission limit in FARR Non-Title V permit |
| Fine Particulates (PM10) | 19 | tpy, based on emission limit in FARR Non-Title V permit |
| Fine Particulates (PM2.5) | 8 | |
| Sulfur Dioxide (SO2) | 21 | tpy, based on emission limit in FARR Non-Title V permit |
| Volatile Organic Compounds (VOC) | 7 | tpy, based on emission limit in FARR Non-Title V permit |

**Notes:**
1. The "All Sources" table sums the values in the "Point Sources" and "Fugitive Sources" tables above

Emissions Inventory based on Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Summary of Facility Potential Hazardous Air Pollutant (HAP) Emissions

**Potential to Emit, (tons per year)**

| **Inorganics** | EU 1<br>Drum Dryer | EU 2<br>Storage Tanks | EU 4<br>Silo Filling | EU 5<br>Truck Loading & Fumes | Single HAP Plantwide Totals (tpy) |
|---|---|---|---|---|---|
| Antimony Compounds | 2.70E-05 | | | | 2.70E-05 |
| Arsenic Compounds (incl arsine) | 8.40E-05 | | | | 8.40E-05 |
| Beryllium Compounds | 0.00E+00 | | | | 0.00E+00 |
| Cadmium Compounds | 6.15E-05 | | | | 6.15E-05 |
| Chromium Compounds (incl hexavalent) | 8.25E-04 | | | | 8.25E-04 |
| Cobalt Compounds | 3.90E-06 | | | | 3.90E-06 |
| Lead Compounds (not elemental lead) | 2.25E-03 | | | | 2.25E-03 |
| Manganese Compounds | 1.16E-03 | | | | 1.16E-03 |
| Mercury Compounds | 3.90E-04 | | | | 3.90E-04 |
| Nickel Compounds | 9.45E-03 | | | | 9.45E-03 |
| Phophorus Compounds | 4.20E-03 | | | | 4.20E-03 |
| Selenium Compounds | 5.25E-05 | | | | 5.25E-05 |
| **Organics** | | | | | |
| Acetaldehyde | 1.95E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.95E-01 |
| Acrolein | 3.90E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.90E-03 |
| Benzene | 5.85E-02 | 7.36E-04 | 5.85E-04 | 4.10E-04 | 6.02E-02 |
| Bromomethane (methyl bromide) | 0.00E+00 | 1.13E-04 | 8.96E-05 | 7.57E-05 | 2.78E-04 |
| 1,3-Butadiene | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Carbon Disulfide | 0.00E+00 | 3.68E-04 | 2.92E-04 | 1.03E-04 | 7.63E-04 |
| Chloroethane (ethyl chloride) | 0.00E+00 | 9.20E-05 | 7.31E-05 | 1.66E-06 | 1.67E-04 |
| Chloromethane (methyl chloride) | 0.00E+00 | 5.29E-04 | 4.20E-04 | 1.18E-04 | 1.07E-03 |
| Cumene | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Dichlorobenzene | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.68E-04 | 8.68E-04 |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | 3.15E-11 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.15E-11 |
| Ethyl Benzene | 3.60E-02 | 8.74E-04 | 6.95E-04 | 2.21E-03 | 3.98E-02 |
| Formaldehyde | 4.65E-01 | 1.59E-02 | 1.26E-02 | 6.94E-04 | 4.94E-01 |
| Furans (all PCDF) | 6.00E-09 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.00E-09 |
| Hexane (incl n-Hexane) | 1.38E-01 | 2.30E-03 | 1.83E-03 | 1.18E-03 | 1.43E-01 |
| Hydrogen Chloride | 3.15E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.15E-02 |
| Isooctane (2,2,4-trimethylpentane) | 6.00E-03 | 7.13E-06 | 5.67E-06 | 1.42E-05 | 6.03E-03 |
| Methyl Chloride (chloromethane) | 0.00E+00 | 6.21E-06 | 4.94E-06 | 0.00E+00 | 1.11E-05 |
| Methyl Chloroform (1,1,1-trichloroethane) | 7.20E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.20E-03 |
| Methyl tert-Butyl Ether (MTBE) | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Naphthalene[1] (also a POM) | 9.75E-02 | 0.00E+00 | 6.93E-04 | 2.70E-03 | 1.01E-01 |
| Phenol | 0.00E+00 | 0.00E+00 | 4.49E-04 | 2.55E-03 | 3.00E-03 |
| Polycyclic Organic Matter* (incl naphthalene) | 1.33E-01 | 0.00E+00 | 4.35E-03 | 5.10E-03 | 1.42E-01 |
| Propionaldehyde | 1.95E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.95E-02 |
| Quinone | 2.40E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.40E-02 |
| Styrene | 0.00E+00 | 1.24E-04 | 9.87E-05 | 5.77E-05 | 2.81E-04 |
| Tetrachloroethane | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.07E-05 | 6.07E-05 |
| Toluene | 4.35E-01 | 1.43E-03 | 1.13E-03 | 1.66E-03 | 4.39E-01 |
| Xylene (incl isomers and mixtures) | 3.00E-01 | 5.91E-03 | 4.70E-03 | 3.87E-03 | 3.14E-01 |

| | EU 1<br>Drum Dryer | EU 2<br>Storage Tanks | EU 4<br>Silo Filling | EU 5<br>Truck Loading & Fumes |
|---|---|---|---|---|
| **Emission Unit HAP Totals** | 1.601 | 0.028 | 0.027 | 0.019 |

| | | | |
|---|---|---|---|
| **Plantwide HAP Total** | 1.675 | tons per year | |
| **Highest Plantwide Single HAP** | 0.494 | tons per year | (formaldehyde) |

**Notes:**
1. Emission-Unit HAP Totals will not equal the sum of individual pollutants
2. Isomers of xylene (m-, p-, o-) are grouped as Xylenes for applicability even though the individual isomers are each listed HAPs in the Clean Air Act
3. Emission units #4, 7 and 8 are not known to emit HAPs

Emissions Inventory based on Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

**Criteria Air Pollutant Emission Inventory**

Emission Unit: **#1 Drum Dryer**
Description: Hot Mix Asphalt Plant Drum Dryer - parallel flow drum mix design
Control: Baghouse
Fuel: RF0, #2 diesel, propane or natural gas (RF0, reprocessed fuel oil is called waste oil by AP-42)
Capacity: 150 tph hot mix asphalt Burner: 75.6 mmBtu/hr capacity
Operation: 2000 hours/year

**Potential to Emit, (tons per year)**

| | RF0 | | #2 Diesel | | Natural Gas | | Max |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | 0.13 | 19.5 | 0.13 | 19.5 | 0.13 | 19.5 | 19.5 |
| Lead | 1.5E-05 | 0.002 | 1.5E-05 | 0.002 | 6.2E-07 | 0.000 | 0.00 |
| NOx | 0.055 | 8.3 | 0.055 | 8.3 | 0.088 | 13.2 | 13.2 |
| PM | 0.090 | 13.6 | 0.090 | 13.6 | 0.090 | 13.6 | 13.6 |
| PM10 | 0.023 | 3.5 | 0.023 | 3.5 | 0.023 | 3.5 | 3.5 |
| PM2.5 | 0.023 | 3.5 | 0.023 | 3.5 | 0.023 | 3.5 | 3.5 |
| SO2 | 0.142 | 21.3 | 0.000 | 0.1 | 0.016 | 2.5 | 21.3 |
| VOC | 0.032 | 4.8 | 0.032 | 4.8 | 0.032 | 4.8 | 4.8 |

**Estimation Explanations**
Emission factor (EF) units are lb/ton HMA product
Worst-case PTE is the higher emitting of the fuel options taking into consideration the most stringent emission limits that exist

CO factor: Option 1: For RFO, diesel, natural gas: AP-42 3/04, Hot Mix Asphalt Plants, Table 11.1-7, uncontrolled (factor can vary greatly) (lb/tonHMA) = 0.13
Option 2: EF based on actual test data while burning propane
EF = (ppm limit) * (1.66E-7 lb/dscf / ppm) * (21-O2test) / (21-O2limit) * (dscf test/min) * (60 min/hr) / (tph HMA)
CO Result = 122 ppm @ 3%O2 MW of CO= 28
measured flow rate = 30600 dscf/min measured during May 2017 test
O2 during test = 16.7 % measured during May 2017 test
Result O2 = 3 %
production during test = 116 ton/hr HMA
emission factor = 0.034 lb/ton HMA
Measured CO emissions are much lower than AP-42 predicts; use the AP42 EF to be conservative.

Lead factor: For RFO, diesel, natural gas: AP-42 3/04, Table 11.1-12, fabric filter controlled (note: assumes fabric filter is necessary to meet NSPS PM limit)

NOx factor: Option 1: For RFO, diesel, natural gas: AP-42 3/04, Table 11.1-7 RF0, uncontrolled (lb/tonHMA) = 0.055 (fuel oil) 0.026 (nat gas)
Option 2: EF Based on test data while burning propane
EF = (ppm limit) * (1.66E-7 lb/dscf / ppm) * (21-O2test) / (21-O2limit) * (dscf test/min) * (60 min/hr) / (tph HMA)
NOx Result = 194 ppm @ 3%O2 MW of NO2= 46
measured flow rate = 30600 dscf/min measured during May 2017 test
O2 during test = 16.7 % measured during May 2017 test
Result O2 = 3 %
production during test = 116 ton/hr HMA
emission factor = 0.088 lb/ton HMA
Measured NOx emissions are higher than AP42 predicts for natural gas; will use the measured EF to be conservative.

PM factor: Option 1: EF based on NSPS limit (40 CFR 60.92, Subpart I) and actual test data as follows (RF0, diesel, natural gas):
EF = (gr/dscf) / (7000 gr/lb) * (dscf/min) * (60 min/hr) / (tph HMA)
NSPS PM Limit = 0.04 gr/dscf (tested at 0.0158 gr/dscf counting front half during May 2009 test)
stack flow during test = 30600 dscf/min measured during May 2017 test
production during test = 116 ton/hr HMA measured during May 2017 test
NSPS-based emission factor = 0.090 lb/ton HMA
Note: NSPS limit is more strict than FARR PM limit of 0.1 gr/dscf, so NSPS will be used for PTE
Option 2: EF Based on AP42, 3/04, Table 11.1-3, PM=0.014 lb/ton for RF0, diesel and natural gas
Note: NSPS based factor is very close to controlled EF from AP-42, so will assume fabric filter is necessary to meet NSPS for all particulates

PM10/PM2.5 factor: AP-42 3/04, Table 11.1-3 -- fabric filter controlled filterable PM10 for RF0, diesel, natural gas (includes condensible particulate)
filterable = 0.0039 organic = 0.0074 inorganic = 0.012 PM10 EF = 0.0233
Note: assumes fabric filter control is required for NSPS, so will use controlled factors for PM10
Emission factor does include condensible PM

SO2 factor: Option 1: EF based on FARR combustion stack SO2 limit (40 CFR 49.129(d)(1)) = 500 ppm (dry volume basis at 7% O2) for RF0 oil, diesel, natural gas
EF = (ppm limit) * (1.66E-7 lb/dscf / ppm) * (21-O2test) / (21-O2limit) * (dscf test/min) * (60 min/hr) / (tph HMA)
SO2 limit = 500 ppm @ 7%O2 MW of SO2= 64
measured flow rate = 30600 dscf/min measured during May 2017 test
O2 during test = 16.7 % measureing during May 2017 test
FARR limit O2 = 7 %
production during test = 116 ton/hr HMA
emission factor = 0.404 lb/ton HMA
Note: FARR process SO2 500 ppm limit is not corrected for O2, so in this case is less strict than the combustion limit
Note: For RFO: AP-42 3/04, Table 11.1-7 (0.058 lb/ton) results in lower emissions, but assumed fuel S content is not listed
Note: For #2 diesel: AP-42 3/04, Table 11.1-7 (0.011 lb/ton) results in lower emissions
Note: For natural gas: AP-42 3/04, Table 11.1-7 (0.0034 lb/ton) results in lower emissions
Option 2: EF based on FARR fuel % sulfur limit (40 CFR 49.130(d)(4)) used oil and #2 diesel are %S by wt
For used oil: EF = (%Slimit / 100)*(max BTU/hr)/(140000 Btu/gal fuel)*(gal fuel/7.88 lb)*(2 lb SO2 per lb S)/(max tph HMA)-(SO2 staying in HMA)
For #2 diesel: EF = (%Slimit / 100)*(max BTU/hr)/(140000 Btu/gal fuel)(gal fuel/7.05 lb)*(2 lb SO2 per lb S)/(max tph HMA)*(SO2 fraction not in HMA)
For nat gas: EF = (ppmSlimit * 32 / 385.1E6)*(max mmBTU/hr)/(1020 Btu/cf fuel)*(2 lb SO2 per lb S)/(max tph HMA)*(1 - SO2 staying in HMA)
nat gas conversion: (ppm S) * (MW) / (385.1E6) = lb S / cf nat gas

| | used oil | diesel | nat gas | |
|---|---|---|---|---|
| FARR S limit = | 0.5 | 0.0015 | 400 | % by weight (nat gas is standard ppmv) |
| max burner firing rate = | 7.56E+07 | 7.56E+07 | 7.56E+07 | BTU/hr |
| fuel heating value = | 1.40E+05 | 1.40E+05 | 1020 | BTU/gal (nat gas is BTU/cf) |
| fuel weight = | 7.88 | 7.05 | | lb/gal |
| max HMA production rate = | 150 | 150 | 150 | ton/hr HMA |
| SO2 staying in HMA = | 50 | 50 | 50 | % not to exceed 0.1 lb/ton (per AP-42 3/2004, Table 11.1-7) |

Emissions Inventory based on Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

| | | | | |
|---|---|---|---|---|
| emission factor = | 0.142 | 0.000 | 0.016 | lb/ton HMA |

Option 3: EF Based on AP42, 3/04, Table 11.1-7 for RF0, diesel and natural gas

For RFO: SO2 = 0.058 lb/ton - so actual emission should be lower, but assumed fuel S content is not listed

For #2 diesel: SO2 = 0.011 lb/ton - so actual emissions should be lower

For natural gas: SO2 = 0.0034 lb/ton - so actual emissions should be lower

RFO SO2 PTE EF will be based on FARR 500 ppm SO2 combustion stack limit because it is more strict than FARR 2% fuel sulfur limit.

#2 diesel SO2 PTE EF will be based on FARR 0.5% sulfur limit because it is more strict than FARR 500 ppm SO2 combustion stack limit.

Natural gas SO2 PTE EF will be based on FARR 400 ppmv sulfur limit because it is more strict than FARR 500 ppm SO2 combustion stack limit.

VOC factor: For RFO, diesel, natural gas: AP-42 3/04, Table 11.1-8, uncontrolled

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#2 Storage Tanks**

Description: Three tanks are used to store petroleum liquids
(Tank 1) Storage of liquid asphalt
(Tank 2) Storage of asphalt in a portable tank trailer
(Tank 3) Storage of #2 diesel in portable tank trailer which supplies on-site

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Liquid: | Asphalt | Asphalt | RFO/Diesel | |
| Control: | none | none | none | |
| Capacity: | 20,000 | 10,000 | 10,000 | gallons (EPA estimate for Tanks No. 2 and 3) |
| Operation: | 2,800,467 | 700,117 | 1,654,752 | EPA-calculated gallons per year throughput |
| TOC Emissions | 46.02 | 18.34 | 14.63 | lbs/yr TOC - value based upon Tanks Program 4.0.9d and adjusted for EPA-calculated throughput |

**Potential to Emit, (tons per year)**

| | Tank 1 - Asphalt | | Tank 2 - RFO | | Tank 3 - #2 diesel | | Total |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | 0.097 | 2.2E-03 | | | | | 0.002 |
| Lead | | | | | | | |
| NOx | | | | | | | |
| PM | | | | | | | |
| PM10 | | | | | | | |
| PM2.5 | | | | | | | |
| SO2 | | | | | | | |
| VOC | 1 | 2.30E-02 | 1 | 9.17E-03 | 1 | 7.3E-03 | 0.039 |

**Estimation Explanations**

Emission factors (EF) units in table are fraction (%/100) of Total Organic Compound (TOC) emissions from computer program

TOC Emissions: Tanks Computer Program (see AP-42, 7.1 (11/06)), lbs/yr; see application for computer program input details
EPA adjusted Tanks Computer Program output to reflect EPA-calculated annual liquid throughput as reflected in table below:

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Modeled Operation: | 2,800,467 | 700,117 | 1,654,752 | gallons per year throughput. Applicant modeled emissions for Tank No. 1 while EPA modeled emissions for Tanks No. 2 and 3. |
| PTE Operation: | 2,800,467 | 700,117 | 1,654,752 | gallons per year throughput as calculated by EPA and presented below |
| Ratio of PTE Operation to Modeled Operation: | 1.00 | 1.00 | 1.00 | |
| Modeled TOC Emissions: | 46.02 | 18.34 | 14.63 | lbs/yr TOC - calculated with Tanks Program 4.0.9d |
| PTE TOC Emissions: | 46.02 | 18.34 | 14.63 | lbs/yr TOC - calculated by adjusting applicant's modeled value for Tank No. 1 by ratio of PTE/modeled annual tank throughput |

VOC factor: For tank 1, EF from AP-42, 3/04, table 11.1-16
For tanks 2, 3, 4 and 5, VOC = TOC

CO factor: AP-42, 3/04, Page 11.1-9; multiply factor by TOC emissions

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#3 Aggregate Handling & Screening**

Description: Three transfers of aggregate and three transfers of recycled asphlat paving (RAP) material from storage pile to drum dryer
a. Aggregate transfer to aggregate bins
b. Aggregate transfer from bins to conveyor belt
c. Aggregate transfer from conveyor to drum mixer
d. RAP transfer to RAP bin
e. RAP transfer from RAP bin to conveyor
e. RAP transfer from conveyor to drum mixer

Control: none

Capacity: 150 tons/hour HMA (worst case assumes all material runs through 3 transfers)
75 tph RAP (assumes 50% max)

Operation: 2000 hours/year

**Potential to Emit, (tons per year)**

| | 6 Aggregate transfers | | 3 RAP transfers | | Scalping Screen | | Total |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE, TPY |
| CO | | | | | | | 0.0 |
| Lead | | | | | | | 0.0 |
| NOx | | | | | | | 0.0 |
| PM | 0.0028 | 2.6 | | 0.0 | 0.0250 | 7.5 | 10.1 |
| PM10 | 0.0013 | 1.2 | | 0.0 | 0.0087 | 2.6 | 3.8 |
| PM2.5 | 0.0002 | 0.2 | | 0.0 | 0.0087 | 2.6 | 2.8 |
| SO2 | | | | | | | 0.0 |
| VOC | | | | | | | 0.0 |

**Estimation Explanations**

Emission factor (EF) units are lb/ton of aggregate handled/screened

PM factor: For transfers, AP-42, 11/06, Section 13.2.4, Equation 1 for each drop operation (worst case assumes all material is aggregate passing through 6 transfers)
Emission factor=k(0.0032)(U/5)^1.3/(M/2)^1.4
U, mean wind speed: 8.9 mph, NOAA data for Spokane found at http://www.ncdc.noaa.gov/oa/climate/online/ccd/wndspd.txt
M, material moisture content: 3 %, Emission Inventory Improvement Program, Vol II, Chapter 3, page 3.2-3, July 1996 (range = 3-7%)
k, particle size multiplier: 0.74 for <30 microns particle size

PM10 factor: For transfers, same as for PM emission factor, except that
k, particle size multiplier: 0.35 for <10 microns particle size

PM10 factor: For transfers, same as for PM emission factor, except that
k, particle size multiplier: 0.053 for <10 microns particle size

Emissions are multiplied by 6 to account for all six transfers

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#4 Silo Filling**

Description: Loading of hot-mix asphalt mix (HMA mix) into Silo
Control: Reinjection of gases to dryer
Capacity: 150 tons/hour HMA
Operation: 2000 hours/year

**Potential to Emit, (tons per year)**

| | Silo filling | |
|---|---|---|
| | EF | PTE TPY |
| CO | 1.18E-03 | 0.18 |
| Lead | | 0 |
| NOx | | 0 |
| PM | 3.32E-04 | 0.05 |
| PM10 | 5.86E-04 | 0.09 |
| PM2.5 | 5.86E-04 | 0.09 |
| SO2 | | 0 |
| VOC | 1.22E-02 | 1.83 |

**Estimation Explanations**

Emission factor (EF) units are lb/ton of HMA handled
Predictive Emission Equations used to calculate Emission Factors from AP-42 3/04, Table 11.1-14

CO factor: $CO\ EF = 0.00488(-V)e^{((0.0251)(T+460)-20.43)}$
PM factor: PM EF = 0.000332 lb/ton HMA (assumes only fraction captured by RM5 counts as PM)
PM10 factor: $PM10\ EF = 0.000332+0.00105(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM10 and that no organic PM appears in the impingers of sampling train)
PM2.5 factor: $PM10\ EF = 0.000332+0.00105(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM2.5 and that no organic PM appears in the impingers of sampling train)
VOC factor: $VOC\ EF = 0.0504(-V)e^{((0.0251)(T+460)-20.43)}$ (100% of TOC measured as propane, per AP42, Table 11.1-16)
V = asphalt volatility = -0.5 AP-42 default value
T = HMA mix temperature = 325 $^{O}$F, AP-42 default value

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#5 Truck Loading & Fumes**
Description: a Load-out of hot-mix asphalt mix (HMA mix) from silo to asphalt trucks
b Fumes from HMA in loaded asphalt trucks while in plant
Control: none
Capacity: 150 tons/hour HMA
Operation: 2000 hours/year

**Potential to Emit, (tons per year)**

| | Silo loadout | | Truck fumes | | Total |
|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | 1.35E-03 | 0.2 | 3.52E-04 | 0.05 | 0.25 |
| Lead | | | | | |
| NOx | | | | | |
| PM | 1.81E-04 | 0.03 | | | 0.03 |
| PM10 | 5.22E-04 | 0.08 | | | 0.08 |
| PM10 | 5.22E-04 | 0.08 | | | 0.08 |
| SO2 | | | | | |
| VOC | 3.91E-03 | 0.59 | 1.03E-03 | 0.16 | 0.75 |

**Estimation Explanations**
Emission factor (EF) units are lb/ton of HMA handled

a Silo Loadout
Predictive Emission Equations used to calculate Emission Factors from AP-42 3/04, Table 11.1-14

CO factor: $0.00558(-V)e^{((0.0251)(T+460)-20.43)}$
PM factor: PM EF = 0.000181 lb/ton HMA (assumes only fraction captured by RM5 counts as PM)
PM10 factor: $0.000181+0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM10 and that no organic PM appears in the impingers of sampling train)
PM2.5 factor: $0.000181+0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ (assumes all of Total PM is PM2.5 and that no organic PM appears in the impingers of sampling train)
VOC factor: $0.94[0.0172(-V)e^{((0.0251)(T+460)-20.43)}]$ (94% of TOC measured as propane, per AP42, Table 11.1-16)

TOC = $0.0172(-V)e^{((0.0251)(T+460)-20.43)}$ AP42, Table 11.1-16
V = asphalt volatility = -0.5 AP-42 default value
T = HMA mix temperature = 325 $^{O}$F, AP-42 default value

b Truck-load emissions (while in plant for approximately 8 minutes)
Emission factors from AP42, 11.1.2.5
TOC = 0.0011 lb/ton
CO factor: (32% of TOC measured as propane)
VOC factor: (94% of TOC measured as propane per AP42, Table 11.1-16)

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#6 Vehicle Traffic**

Description: Road dust caused by vehicle traffic
a. Truck for loading and delivery of HMA product:
b. Loader for delivering aggregate and RAP to drum dryer loading bins:
c. Truck for delivering gravel and RAP to plant
d. Asphalt truck delivering asphalt to plant

| | | | |
|---|---|---|---|
| Control: | none | | |
| Capacity: | 150 | tons per hour HMA (plant) | (assume 5% is asphalt oil) |
| | 300000 | tons per year HMA | |
| | 1751 | gal/hr liquid asphalt | (11.67 gal/tonHMA from application) |
| | 3,500,584 | gal/yr liquid asphalt | (from tank sheet) |
| | 15,000 | ton/yr liquid asphalt | (8.57 lb/gal from AP42) |
| | 531,000 | gal/yr diesel | (531,000 is 1.77 gal/tonHMA; 1,654,752 from application) |
| | 2,092 | tons/yr diesel | (7.88 lbs/gal from application) |
| Operation: | 2000 | hours/year | |

**Potential to Emit, (tons per year)**

| | HMA Truck PTE TPY | Loaders PTE TPY | Gravel/RAP Truck PTE TPY | Liquid Truck PTE TPY | Total PTE TPY |
|---|---|---|---|---|---|
| CO | | | | | |
| Lead | | | | | |
| NOx | | | | | |
| PM | 12.16 | 30.13 | 0.46 | 0.09 | 42.8 |
| PM10 | 3.10 | 8.30 | 0.12 | 0.02 | 11.5 |
| PM2.5 | 0.31 | 0.83 | 0.01 | 0.00 | 1.2 |
| SO2 | | | | | |
| VOC | | | | | |

**Estimation Explanations**

Emission factor (EF) units are lb/vehicle mile traveled
Assumes that 100% of trip distance is on unpaved surface for all vehicles
Liquid asphalt/fuel delivery truck size = 8168 gallons
Spokane data from: http://www.nrcc.cornell.edu/ccd/prge0198.html
Predictive Emission Equations used to calculate Emission Factors from AP-42 12/03, Section 13.2.2, Equation 1a and 2
E = EF x VMT / 2000
PM EF: k*(s/12)^a*(W/3)^b*(1-P/N), from 11/06 AP-42 13.2.2, Equation 1a and 2, see below for parameters
PM10 factor: Same equation as for PM emission factor except some different parameters, see below

Road Data:

| | PM | PM10 | |
|---|---|---|---|
| empirical constant (k) = | 4.9 | 1.5 | PM data for particles <30 microns PM2.5 = 0.15 |
| material handling silt content (s), % = | 7.1 | 7.1 | silt from AP-42 Table 13.2.2-1 (sand and gravel - for loader) |
| road surface silt content (s), % = | 4.8 | 4.8 | silt from AP-42 Table 13.2.2-1 (sand and gravel - for roads) |
| empirical constant (a) = | 0.7 | 0.9 | PM data for particles <30 microns |
| empirical constant (b) = | 0.45 | 0.45 | PM data for particles <30 microns |

Vehicle Data: (from company except asphalt delivery truck wt from EPA experience)

| | HMA Truck | Loader | Oil Truck | Fuel Truck |
|---|---|---|---|---|
| empty weight, tons = | 18.1 | 26.0 | 10.0 | 10.0 |
| loaded weight, tons = | 43.1 | 32.5 | 40.0 | 30.0 |
| mean vehicle weight (W), tons = | 30.6 | 29.3 | 25.0 | 20.0 |
| tons per trip, tons = | 25.0 | 6.5 | 30.0 | 20.0 |
| trips per day = | 144.0 | 553.8 | 1.4 | 0.0 |
| trips per year = | 12000 | 46154 | 500 | 105 |
| round trip distance, miles = | 0.4 | 0.2 | 0.4 | 0.4 |
| unpaved VMT, miles/year = | 4800 | 9231 | 200 | 42 |

Weather Data:

| | | |
|---|---|---|
| # of days with > 0.01 inch of precipitation (P) = | 113 | For Spokane, WA: http://www.nrcc.cornell.edu/ccd/prge0198.html |
| # of days in averaging period (N) = | 365 | based on need for annual PTE |

Emission factors:

| | HMA Truck | Loader - Stockpile Area | Oil Truck | Fuel Truck |
|---|---|---|---|---|
| PM EF, lb/VMT = | 5.07 | 6.53 | 4.63 | 4.18 |
| PM10 EF, lb/VMT = | 1.29 | 1.80 | 1.18 | 1.07 |
| PM2.5. lb/VMT= | 0.13 | 0.18 | 0.12 | 0.11 |

## Criteria Air Pollutant Emission Inventory

Emission Unit: **#7 Wind Erosion**

| | | |
|---|---|---|
| Description: | Wind erosion of all exposed areas including piles | |
| Control: | none | |
| Capacity: | 150 | tons/hour HMA |
| Operation: | 2000 | hours/year |
| | 300000 | tons/yr (tons/hr x hours/yr) |
| | 5769.23077 | tons/pile (assumes a 1 week supply is available on site so divide total yearly amount by 52) |
| | 109890.11 | ft3 per pile, assumes aggregate density is 105 lb/cu ft (Weights of Materials, page 393) |
| Pile height: | 50 | feet, assumed |
| Pile width: | 200 | feet, assumed |
| Pile length: | 11.0 | feet |
| Pile Footprint: | 2,198 | ft2 |
| | 0.05 | acres, assumes 43560 ft2/acre |
| Open Area: | 2.00 | acres, assumed conservative sized (disturbed) site - unvegetated area |

**Potential to Emit, (tons per year)**

| | Pile Wind Erosion | | Open Area Wind Erosion | | Total |
|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| CO | | | | | |
| Lead | | | | | |
| NOx | | | | | |
| PM | 0.35 | 0.02 | 0.35 | 0.70 | 0.72 |
| PM10 | 0.16 | 0.01 | 0.16 | 0.33 | 0.34 |
| PM2.5 | 0.01 | 0.02 | 0.01 | 0.00 | 0.02 |
| SO2 | | | | | |
| VOC | | | | | |

**Estimation Explanations**

Emission factor (EF) units are tons/acre per year

Stockpile size calculated based on maximum capacity, operating 8760 hr/yr

PM factor: AP-42, 10/98, Section 11.9, Table 11.9-4 for wind erosion of exposed areas

PM10 factor: Engineering estimate - 47% of PM factor from ratio of transfer particle size multipliers (0.35/0.74) in AP-42 1/95 13.2.4

PM2.5 factor: Engineering estimate - 7.2% of PM factor from ratio of transfer particle size multipliers (0.053/0.74) in AP-42 1/95 13.2.4

Emissions Inventory based on Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#1 Drum Dryer**
Description: Hot Mix Asphalt Plant Drum Dryer - parallel flow drum mix design
Control: Baghouse
Fuel: RF0, #2 diesel, propane or natural gas (RF0, reprocessed fuel oil is called waste oil by AP-42)
Capacity: 150 tph hot mix asphalt Burner: 75.6 mmBtu/hr capacity
Operation: 2000 hours/year
Fuel: 1,010,000 gallons per year of liquid fuel (waste oil/reprocessed fuel oil, distallate and residual fuel oil)

**Potential to Emit, (tons per year)**

| **Inorganics** | RF0 | | #2 diesel | | Natural Gas | | Max |
|---|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| Antimony Compounds | 1.80E-07 | 2.70E-05 | 1.80E-07 | 2.70E-05 | 1.80E-07 | 2.70E-05 | 2.70E-05 |
| Arsenic Compounds (incl arsine) | 5.60E-07 | 8.40E-05 | 5.60E-07 | 8.40E-05 | 5.60E-07 | 8.40E-05 | 8.40E-05 |
| Beryllium Compounds | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Cadmium Compounds | 4.10E-07 | 6.15E-05 | 4.10E-07 | 6.15E-05 | 4.10E-07 | 6.15E-05 | 6.15E-05 |
| Chromium Compounds (incl hexavalent) | 5.50E-06 | 8.25E-04 | 5.50E-06 | 8.25E-04 | 5.50E-06 | 8.25E-04 | 8.25E-04 |
| Cobalt Compounds | 2.60E-08 | 3.90E-06 | 2.60E-08 | 3.90E-06 | 2.60E-08 | 3.90E-06 | 3.90E-06 |
| Lead Compounds (not elemental lead) | 1.50E-05 | 2.25E-03 | 1.50E-05 | 2.25E-03 | 6.20E-07 | 9.30E-05 | 2.25E-03 |
| Manganese Compounds | 7.70E-06 | 1.16E-03 | 7.70E-06 | 1.16E-03 | 7.70E-06 | 1.16E-03 | 1.16E-03 |
| Mercury Compounds | 2.60E-06 | 3.90E-04 | 2.60E-06 | 3.90E-04 | 2.40E-07 | 3.60E-05 | 3.90E-04 |
| Nickel Compounds | 6.30E-05 | 9.45E-03 | 6.30E-05 | 9.45E-03 | 6.30E-05 | 9.45E-03 | 9.45E-03 |
| Phophorus Compounds | 2.80E-05 | 4.20E-03 | 2.80E-05 | 4.20E-03 | 2.80E-05 | 4.20E-03 | 4.20E-03 |
| Selenium Compounds | 3.50E-07 | 5.25E-05 | 3.50E-07 | 5.25E-05 | 3.50E-07 | 5.25E-05 | 5.25E-05 |
| **Organics** | | | | | | | |
| Acetaldehyde | 1.30E-03 | 1.95E-01 | - | | - | | 1.95E-01 |
| Acrolein | 2.60E-05 | 3.90E-03 | - | | - | | 3.90E-03 |
| Benzene | 3.90E-04 | 5.85E-02 | 3.90E-04 | 5.85E-02 | 3.90E-04 | 5.85E-02 | 5.85E-02 |
| Bromomethane (methyl bromide) | - | | - | | - | | |
| 1,3-Butadiene | - | | - | | - | | |
| Carbon Disulfide | - | | - | | - | | |
| Chloroethane (ethyl chloride) | - | | - | | - | | |
| Chloromethane (methyl chloride) | - | | - | | - | | |
| Dichlorobenzene | - | | - | | - | | |
| Cumene | - | | - | | - | | |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | 2.10E-13 | 3.15E-11 | 2.10E-13 | 3.15E-11 | | 0.00E+00 | 3.15E-11 |
| Ethyl Benzene | 2.40E-04 | 3.60E-02 | 2.40E-04 | 3.60E-02 | 2.40E-04 | 3.60E-02 | 3.60E-02 |
| Formaldehyde | 3.10E-03 | 4.65E-01 | 3.10E-03 | 4.65E-01 | 3.10E-03 | 4.65E-01 | 4.65E-01 |
| Furans (all PCDF) | 4.00E-11 | 6.00E-09 | 4.00E-11 | 6.00E-09 | | 0.00E+00 | 6.00E-09 |
| Hexane (includes n-Hexane) | 9.20E-04 | 1.38E-01 | 9.20E-04 | 1.38E-01 | 9.20E-04 | 1.38E-01 | 1.38E-01 |
| Hydrochloric Acid (hydrogen chloride) | 2.10E-04 | 3.15E-02 | - | | - | | 3.15E-02 |
| Isooctane (2,2,4-trimethylpentane) | 4.00E-05 | 6.00E-03 | 4.00E-05 | 6.00E-03 | 4.00E-05 | 6.00E-03 | 6.00E-03 |
| Methyl Chloride (chloromethane) | - | | - | | - | | |
| Methyl Chloroform (1,1,1-trichloroethane) | 4.80E-05 | 7.20E-03 | 4.80E-05 | 7.20E-03 | 4.80E-05 | 7.20E-03 | 7.20E-03 |
| Methyl tert-Butyl Ether (MTBE) | - | | - | | - | | |
| Naphthalene (also a POM) | 6.50E-04 | 9.75E-02 | 8.80E-09 | 1.32E-06 | 9.00E-05 | 1.35E-02 | 9.75E-02 |
| Phenol | - | | - | | - | | |
| Polycyclic Organic Matter* (incl naphthalene) | 8.85E-04 | 1.33E-01 | 8.85E-04 | 1.33E-01 | 1.87E-04 | 2.81E-02 | 1.33E-01 |
| Propionaldehyde | 1.30E-04 | 1.95E-02 | - | | - | | 1.95E-02 |
| Quinone | 1.60E-04 | 2.40E-02 | - | | - | | 2.40E-02 |
| Styrene | - | | - | | - | | |
| Tetrachloroethane | - | | - | | - | | |
| Toluene | 2.90E-03 | 4.35E-01 | 2.90E-03 | 4.35E-01 | 1.50E-04 | 2.25E-02 | 4.35E-01 |
| Xylenes (inlc isomers and mixtures) | 2.00E-04 | 3.00E-02 | 2.00E-03 | 3.00E-01 | 2.00E-04 | 3.00E-02 | 3.00E-01 |
| **HAP Total** | 1.60E+00 | | 1.60E+00 | | 8.07E-01 | | 1.60E+00 |

| ***Polycyclic Organic Matter** | RF0 | | #2 diesel | | Natural Gas | |
|---|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY |
| Acenaphthene | 1.40E-06 | 2.10E-04 | 1.40E-06 | 2.10E-04 | 1.40E-06 | 2.10E-04 |
| Acenaphthylene | 2.20E-05 | 3.30E-03 | 2.20E-05 | 3.30E-03 | 8.60E-06 | 1.29E-03 |
| Anthracene | 3.10E-06 | 4.65E-04 | 3.10E-06 | 4.65E-04 | 2.20E-07 | 3.30E-05 |
| Benzo(a)anthracene | 2.10E-07 | 3.15E-05 | 2.10E-07 | 3.15E-05 | 2.10E-07 | 3.15E-05 |
| Benzo(b)fluoranthene | 1.00E-07 | 1.50E-05 | 1.00E-07 | 1.50E-05 | 1.00E-07 | 1.50E-05 |
| Benzo(k)fluoranthene | 4.10E-08 | 6.15E-06 | 4.10E-08 | 6.15E-06 | 4.10E-08 | 6.15E-06 |
| Benzo(g,h,i)perylene | 4.00E-08 | 6.00E-06 | 4.00E-08 | 6.00E-06 | 4.00E-08 | 6.00E-06 |
| Benzo(a)pyrene | 9.80E-09 | 1.47E-06 | 9.80E-09 | 1.47E-06 | 9.80E-09 | 1.47E-06 |
| Benzo(e)pyrene | 1.10E-07 | 1.65E-05 | 1.10E-07 | 1.65E-05 | 1.10E-07 | 1.65E-05 |
| Chrysene | 1.80E-07 | 2.70E-05 | 1.80E-07 | 2.70E-05 | 1.80E-07 | 2.70E-05 |
| Dioxins (Total PCDD; incl 2,3,7,8 TCDD) | 7.90E-11 | 1.19E-08 | 2.10E-13 | 3.15E-11 | - | |
| Fluoranthene | 6.10E-07 | 9.15E-05 | 6.10E-07 | 9.15E-05 | 6.10E-07 | 9.15E-05 |
| Fluorene | 1.10E-05 | 1.65E-03 | 1.10E-05 | 1.65E-03 | 3.80E-06 | 5.70E-04 |
| Furans (all PCDF) | 4.00E-11 | 6.00E-09 | 4.00E-11 | 6.00E-09 | - | |
| Indeno(1,2,3-cd)pyrene | 7.00E-09 | 1.05E-06 | 7.00E-09 | 1.05E-06 | 7.00E-09 | 1.05E-06 |
| 2-Methylnaphthalene | 1.70E-04 | 2.55E-02 | 1.70E-04 | 2.55E-02 | 7.40E-05 | 1.11E-02 |
| Naphthalene (also individual HAP) | 6.50E-04 | 9.75E-02 | 6.50E-04 | 9.75E-02 | 9.00E-05 | 1.35E-02 |
| Perylene | 8.80E-09 | 1.32E-06 | 8.80E-09 | 1.32E-06 | 8.80E-09 | 1.32E-06 |
| Phenanthrene | 2.30E-05 | 3.45E-03 | 2.30E-05 | 3.45E-03 | 7.60E-06 | 1.14E-03 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pyrene | 3.00E-06 | 4.50E-04 | 3.00E-06 | 4.50E-04 | 5.40E-07 | 8.10E-05 |
| **POM Subtotal** | 8.85E-04 | 1.33E-01 | 8.85E-04 | 1.33E-01 | 1.87E-04 | 2.81E-02 |

**Estimation Explanations**

Emission factor (EF) units are lb/ton HMA

Worst-case PTE is the higher emitting of the fuel options taking into consideration the most stringent emission limits that exist

To avoid double-counting, "HAP Total" does not count naphthalene, dioxin (HAP) or furans separately because they are accounted for in "POM Subtotal"

| | |
|---|---|
| Chromium EF: | Chromium EF is assumed to included separately reported hexavalent chromium EF in AP-42 |
| Hydrogen chloride EF: | AP-42, Table 11.1-8 for RF0 |
| All other inorganics EF: | AP-42, 3/04, Table 11.1-12 for fuel oil and RF0 with fabric filter |
| Dioxin EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter - all dioxins are POM; only 2,3,7,8 TCDD is a HAP |
| Furans EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter - total of all furans (is a HAP & POM) |
| Naphthalene EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter (is a HAP & POM) |
| POM EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter (includes naphthalene, dioxin & furans) |
| All other organics EF: | AP-42, 3/04, Table 11.1-10 for fuel oil & RF0 with fabric filter |

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#2 Storage Tanks**
Description: Three tanks are used to store petroleum liquids
(Tank 1) Storage of liquid asphalt
(Tank 2) Storage of asphalt in a portable tank trailer
(Tank 3) Storage of #2 diesel in portable tank trailer which supplies the on-site vehicles

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Liquid: | Asphalt | Asphalt | #2 Diesel | |
| Control: | none | none | none | |
| Capacity: | 10,000 | 10,000 | 10,000 | gallons (EPA estimate for Tanks No. 2 and 3) |
| Operation: | 2,800,467 | 700,117 | 1,654,752 | EPA-calculated gallons per year throughput |
| TOC Emissions | 46.02 | 18.34 | 14.63 | lbs/yr TOC - value based upon Tanks Program 4.0.9d and adjusted for EPA-calculated throughput |

**Potential to Emit, (tons per year)**

| | (Tank 1) Asphalt | | (Tank 2) RFO | | (Tank 3) #2 diesel | | Total |
|---|---|---|---|---|---|---|---|
| **Organics** | EF | PTE TPY | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| Acetaldehyde | | | | | | | |
| Acrolein | | | | | | | |
| Benzene | 0.032 | 7.36E-04 | | 0.00E+00 | | 0.00E+00 | 7.36E-04 |
| Bromomethane (methyl bromide) | 0.0049 | 1.13E-04 | | 0.00E+00 | | 0.00E+00 | 1.13E-04 |
| 1,3-Butadiene | | | | | | | |
| Carbon Disulfide | 0.016 | 3.68E-04 | | 0.00E+00 | | 0.00E+00 | 3.68E-04 |
| Chloroethane (ethyl chloride) | 0.004 | 9.20E-05 | | 0.00E+00 | | 0.00E+00 | 9.20E-05 |
| Chloromethane (methyl chloride) | 0.023 | 5.29E-04 | | 0.00E+00 | | 0.00E+00 | 5.29E-04 |
| Cumene | | | | | | | |
| Dichlorobenzene | | | | | | | |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | | | | | | | |
| Ethyl Benzene | 0.038 | 8.74E-04 | | 0.00E+00 | | 0.00E+00 | 8.74E-04 |
| Formaldehyde | 0.69 | 1.59E-02 | | 0.00E+00 | | 0.00E+00 | 1.59E-02 |
| Furans (all PCDF) | | | | | | | |
| Hexane (incl n-Hexane) | 0.1 | 2.30E-03 | | 0.00E+00 | | 0.00E+00 | 2.30E-03 |
| Hydrochloric Acid (hydrogen chloride) | | | | | | | |
| Isooctane (2,2,4-trimethylpentane) | 0.00031 | 7.13E-06 | | 0.00E+00 | | 0.00E+00 | 7.13E-06 |
| Methyl Chloride (chloromethane) | 0.00027 | 6.21E-06 | | 0.00E+00 | | 0.00E+00 | 6.21E-06 |
| Methyl Chloroform (1,1,1-trichloroethane) | | | | | | | |
| Methyl tert-Butyl Ether (MTBE) | | | | | | | |
| Naphthalene[1] (also a POM) | | | | | | | |
| Phenol | | | | | | | |
| Polycyclic Organic Matter* (incl naphthalene) | | | | | | | |
| Propionaldehyde | | | | | | | |
| Quinone | | | | | | | |
| Styrene | 0.0054 | 1.24E-04 | | 0.00E+00 | | 0.00E+00 | 1.24E-04 |
| Tetrachloroethane | | | | | | | |
| Toluene | 0.062 | 1.43E-03 | | 0.00E+00 | | 0.00E+00 | 1.43E-03 |
| Xylene (incl isomers and mixtures) | 0.257 | 5.91E-03 | | 0.00E+00 | | 0.00E+00 | 5.91E-03 |
| **HAP Total** | | 2.84E-02 | | 0.00E+00 | | 0.00E+00 | 2.84E-02 |

**Estimation Explanations**
Emission factor (EF) units are % of organic PM for POM and phenol and fraction (%/100) of TOC for all other organics
TOC Emissions: Tanks Computer Program (see AP-42, 7.1 (11/06)), lbs/yr; see application for computer program input details
EPA adjusted Tanks Computer Program output to reflect EPA-calculated annual liquid throughput as reflected in table below:

| Parameter | Tank 1 | Tank 2 | Tank 3 | Units |
|---|---|---|---|---|
| Modeled Operation: | 2,800,467 | 700,117 | 1,654,752 | gallons per year throughput. Applicant modeled emissions for Tank No. 1 while EPA modeled emissions for Tanks No. 2 and 3. |
| Operation: | 2,800,467 | 700,117 | 1,654,752 | gallons per year throughput as calculated by EPA and |
| Ratio of PTE Operation to Modeled Operation: | 1.00 | 1.00 | 1.00 | |
| TOC Emissions: | 46.02 | 18.34 | 14.63 | lbs/yr TOC - calculated with Tanks Program 4.0.9d |
| PTE TOC Emissions: | 46.02 | 18.34 | 14.63 | lbs/yr TOC - calculated by adjusting applicant's modeled value for Tank No. 1 by ratio of PTE/modeled annual tank throughput |

To avoid double-counting, "HAP Total" does not count naphthalene separately because naphthalene is accounted for in "POM Subtotal"
Xylenes EF: m-, o- and p- isomers are individually listed as HAPs but for applicability purposes, are grouped as Xylenes
All other organics EF: AP-42, 3/04, Table 11.1-16 - (TOC) organic volatile-based speciation percentages
TOC = VOC/100% (AP-42, 3/04, Table 11.1-16)
For diesel and RFO, HAP data is not presented, because HAP emissions are expected to be very low

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#4 Silo Filling**
Description: Loading of hot-mix asphalt mix (HMA mix) into silo
Control: Reinjection of gases to dryer
Capacity: 150 tons/hr HMA (from applicant)
Operation: 2,000 hours/yr

**Potential to Emit, (tons per year)**

| **Organics** | EF | PTE TPY |
|---|---|---|
| Acetaldehyde | | |
| Acrolein | | |
| Benzene | 0.032 | 5.85E-04 |
| Bromomethane (methyl bromide) | 0.0049 | 8.96E-05 |
| 1,3-Butadiene | | |
| Carbon Disulfide | 0.016 | 2.92E-04 |
| Chloroethane (ethyl chloride) | 0.004 | 7.31E-05 |
| Chloromethane (methyl chloride) | 0.023 | 4.20E-04 |
| Cumene | | |
| Dichlorobenzene | | |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | | |
| Ethyl Benzene | 0.038 | 6.95E-04 |
| Formaldehyde | 0.69 | 1.26E-02 |
| Furans (all PCDF) | | |
| Hexane (incl n-Hexane) | 0.1 | 1.83E-03 |
| Hydrochloric Acid (hydrogen chloride) | | |
| Isooctane (2,2,4-trimethylpentane) | 0.00031 | 5.67E-06 |
| Methyl Chloride (chloromethane) | 0.00027 | 4.94E-06 |
| Methyl Chloroform (1,1,1-trichloroethane) | | |
| Methyl tert-Butyl Ether (MTBE) | | |
| Naphthalene[1] (also a POM) | 1.82 | 6.93E-04 |
| Phenol | 1.18 | 4.49E-04 |
| Polycyclic Organic Matter* (incl naphthalene) | 11.41 | 4.35E-03 |
| Propionaldehyde | | |
| Quinone | | |
| Styrene | 0.0054 | 9.87E-05 |
| Tetrachloroethane | | |
| Toluene | 0.062 | 1.13E-03 |
| Xylene (incl isomers and mixtures) | 0.257 | 4.70E-03 |
| **HAP Total** | | 2.73E-02 |

| ***Polycyclic Organic Matter** | EF | PTE TPY |
|---|---|---|
| Acenaphthene | 0.47 | 1.79E-04 |
| Acenaphthylene | 0.014 | 5.33E-06 |
| Anthracene | 0.13 | 4.95E-05 |
| Benzo(a)athracene | 0.056 | 2.13E-05 |
| Benzo(e)pyrene | 0.0095 | 3.62E-06 |
| Chrysene | 0.21 | 8.00E-05 |
| Fluoranthene | 0.15 | 5.71E-05 |
| Fluorene | 1.01 | 3.85E-04 |
| 2-Methylnaphthalene | 5.27 | 2.01E-03 |
| Naphthalene (also individual HAP) | 1.82 | 6.93E-04 |
| Perylene | 0.03 | 1.14E-05 |
| Phenanthrene | 1.8 | 6.86E-04 |
| Pyrene | 0.44 | 1.68E-04 |
| **POM Subtotal** | 11.41 | 4.35E-03 |

**Estimation Explanations**
Emission factor (EF) units are % of organic PM for POM and phenol and % of TOC for all other organics
To avoid double-counting, "HAP Total" does not count naphthalene separately because naphthalene is accounted for in "POM Subtotal"
Predictive emission factors from AP-42 Tbl 11.1-14 for silo filling
Xylenes EF: m-, o- and p- isomers are individually listed as HAPs but for applicability purposes, are grouped as Xylenes
POM, naphthalene and phenol EF: AP-42, 3/04, Table 11.1-15 - organic particulate-based speciation percentages (%/100 x PM)
All other organics EF: AP-42, 3/04, Table 11.1-16 - (TOC) organic volatile-based speciation percentages (%/100 x TOC)

TOC EF: $0.0504(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded into silo

Organic PM EF: $0.00105(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded into silo

V = asphalt volatility = -0.5 AP-42 default value
T = HMA mix temperature = 325 $^{O}$F, AP-42 default value
TOC EF = 1.22E-02 lb/ton
TOC emissions = 1.83E+00 tons/year (TOC EF x annual capacity)
Organic PM EF = 2.54E-04 lb/ton
Organic PM emissions = 3.81E-02 tons/year (Organic PM EF x annual capacity)

## Hazardous Air Pollutant Emission Inventory

Emission Unit: **#5 Truck Loading & Fumes**
Description: a Load-out of hot-mix asphalt mix (HMA mix) from silo to asphalt trucks
b Fumes from loaded asphalt trucks while in plant
Control: none
Capacity: 150 tons/hr HMA (from applicant)
Operation: 2,000 hours/yr

**Potential to Emit, (tons per year)**

| Organics | Truck loading | | Truck-load fumes | | Total |
|---|---|---|---|---|---|
| | EF | PTE TPY | EF | PTE TPY | PTE TPY |
| Acetaldehyde | | | | | |
| Acrolein | | | | | |
| Benzene | 0.052 | 3.24E-04 | 0.052 | 8.58E-05 | 0.000 |
| Bromomethane (methyl bromide) | 0.0096 | 5.99E-05 | 0.0096 | 1.58E-05 | 0.000 |
| 1,3-Butadiene | | | | | |
| Carbon Disulfide | 0.013 | 8.11E-05 | 0.013 | 2.15E-05 | 0.000 |
| Chloroethane (ethyl chloride) | 0.00021 | 1.31E-06 | 0.00021 | 3.47E-07 | 0.000 |
| Chloromethane (methyl chloride) | 0.015 | 9.36E-05 | 0.015 | 2.48E-05 | 0.000 |
| Dichlorobenzene | | | | | |
| Cumene | 0.11 | 6.86E-04 | 0.11 | 1.82E-04 | 0.001 |
| Dioxin (2,3,7,8 tetrachlorodibenzo-p-dioxin) | | | | | |
| Ethyl Benzene | 0.28 | 1.75E-03 | 0.28 | 4.62E-04 | 0.002 |
| Formaldehyde | 0.088 | 5.49E-04 | 0.088 | 1.45E-04 | 0.001 |
| Furans (all PCDF) | | | | | |
| Hexane (incl n-Hexane) | 0.15 | 9.36E-04 | 0.15 | 2.48E-04 | 0.001 |
| Hydrochloric Acid (hydrogen chloride) | | | | | |
| Isooctane (2,2,4-trimethylpentane) | 0.0018 | 1.12E-05 | 0.0018 | 2.97E-06 | 0.000 |
| Methyl Chloride (chloromethane) | | | | | |
| Methyl Chloroform (1,1,1-trichloroethane) | | | | | |
| Methyl tert-Butyl Ether (MTBE) | | | | | |
| Naphthalene[1] (also a POM) | 1.25 | 6.39E-04 | 1.25 | 2.06E-03 | 0.003 |
| Phenol | 1.18 | 6.03E-04 | 1.18 | 1.95E-03 | 0.003 |
| Polycyclic Organic Matter* (incl naphthalene) | 5.93 | 3.04E-03 | 1.25 | 2.06E-03 | 0.005 |
| Propionaldehyde | | | | | |
| Quinone | | | | | |
| Styrene | 0.00732 | 4.57E-05 | 0.00732 | 1.21E-05 | 0.000 |
| Tetrachloroethane | 0.0077 | 4.80E-05 | 0.0077 | 1.27E-05 | 0.000 |
| Toluene | 0.21 | 1.31E-03 | 0.21 | 3.47E-04 | 0.002 |
| Xylene (incl isomers and mixtures) | 0.49 | 3.06E-03 | 0.49 | 8.09E-04 | 0.004 |
| **HAP Total** | | 1.26E-02 | | 6.38E-03 | 1.90E-02 |

| *Polycyclic Organic Matter | EF | PTE TPY | EF | PTE TPY |
|---|---|---|---|---|
| Acenaphthene | 0.26 | 1.33E-04 | | |
| Acenaphthylene | 0.028 | 1.43E-05 | | |
| Anthracene | 0.07 | 3.58E-05 | | |
| Benzo(a)athracene | 0.019 | 9.72E-06 | | |
| Benzo(b)fluoranthene | 0.0076 | 3.89E-06 | | |
| Benzo(k)fluoranthene | 0.0022 | 1.13E-06 | | |
| Benzo(g,h,l)perylene | 0.0019 | 9.72E-07 | | |
| Benzo(a)pyrene | 0.0023 | 1.18E-06 | | |
| Benzo(e)pyrene | 0.0078 | 3.99E-06 | | |
| Chrysene | 0.103 | 5.27E-05 | | |
| Dibenzo(a,h)anthracene | 0.00037 | 1.89E-07 | | |
| Fluoranthene | 0.05 | 2.56E-05 | | |
| Fluorene | 0.77 | 3.94E-04 | | |
| Indeno(1,2,3-cd)pyrene | 0.00047 | 2.40E-07 | | |
| 2-Methylnaphthalene | 2.38 | 1.22E-03 | | |
| Naphthalene (also individual HAP) | 1.25 | 6.39E-04 | 1.25 | 2.06E-03 |
| Perylene | 0.022 | 1.13E-05 | | |
| Phenanthrene | 0.81 | 4.14E-04 | | |
| Pyrene | 0.15 | 7.67E-05 | | |
| **POM Subtotal** | 5.93 | 3.04E-03 | 1.25 | 2.06E-03 |

**Estimation Explanations**

Emission factor (EF) units are % of organic PM for POM and phenol and % of TOC for all other organics

To avoid double-counting, "HAP Total" does not count naphthalene separately because naphthalene is accounted for in "POM Subtotal"

POM, naphthalene and phenol EF: AP-42, 3/04, Table 11.1-15 - organic particulate-based speciation percentages

All other organics EF: AP-42, 3/04, Table 11.1-16 - (TOC) organic volatile-based speciation percentages

Xylenes EF: m-, o- and p- isomers are individually listed as HAPs but for applicability purposes, are grouped as Xylenes

a. Truck loading predictive emission factors from AP-42 Tbl 11.1-14

TOC EF: $0.0172(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded out

Organic PM EF: $0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ lb/ton HMA loaded out

V = asphalt volatility = -0.5 AP-42 default value

Emissions Inventory based on Synthetic Minor Source Permit
Granite Construction Company
Hot Mix Asphalt Plant

| | | |
|---|---|---|
| T = HMA mix temperature = | 325 | $^{O}$F, AP-42 default value |
| TOC EF = | 4.16E-03 | lb/ton |
| TOC emissions = | 6.24E-01 | tons/year (TOC EF x annual capacity) |
| Organic PM EF = | 3.41E-04 | lb/ton |
| Organic PM emissions = | 5.11E-02 | tons/year (Organic PM EF x annual capacity) |

b. Truck-load emission factors from AP42, 11.1.2.5

| | | |
|---|---|---|
| TOC EF: | 1.10E-03 | lb/ton HMA hauled by trucks |
| TOC emissions = | 0.17 | tons/year (TCO EF x annual capacity) |