Technical Support Document for Portable and Stationary Concrete Batch Plant General Order Approval Order No. 26AQ-GO-03

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1. Project Summary

General Orders are a subset of Ecology's Notic of Construction (NOC) permitting under the minor New Source Review program. This General Order update continues the practice of combining the options for either portable or stationary concrete batch operations similar to the 2011 concrete batch general order (General Order of Approval 10AQ-GO-01 Amendment 1, April 2011).

Because the combined general order options made it difficult for Ecology to track when a portable facility became a stationary facility and vice versa, this new combined general order has added features to help Ecology staff better track the status of concrete batch plant operations covered under this general order.

This General Order of Approval was updated to address more recent toxic air pollutant (TAP) rules of Chapter 173-460 WAC than were in effect at the time of the 2011 General Order. This General Order also continues to satisfy requirements for relocation of portable sources in WAC 173-400-036 and the requirements for issuing a General Order of Approval as discussed in WAC 173-400-560.

Based on updated modeling, this general order has a different concrete production limit than the previous Ecology concrete batch general order. The 2011 general order allowed central mix production limits of 495,000 tons per year (246,000 $yards^3$) and truck mix production limits of 150,000 tons per year (74,500 $yards^3$). This current general order maintains those values but now specifies these limits for operations in a single pit. This current general order also has daily and hourly limits which are also for operation in a single pit. Bothe the central mix and truck mix daily and hourly limits are 9,050 tons per day (4,500 $yards^3$) and 1000 tons per hour (500 $yards^3$).

Another update to this general order is for San Juan County. Ecology has given jurisdiction for San Juan County air permitting to the Northwest Clean Air Agency as of July 1, 2025. For this reason, San Juan County no longer is listed with the Ecology Counties that can apply for coverage under this general order.

Previous concrete batch plant general orders remain in effect for concrete batch plants operating under a valid order for their sources. Any new concrete batch plant must comply with the requirements of this General Order.

The old concrete batch general orders remain in effect for concrete batch plants covered under a valid order for their sources. After the issuance date of this general order, concrete batch plant applicants who wish to obtain coverage for a general order must comply with the requirements of this General Order.

2. Application Processing

a. General Order application process options

Based on WAC 173-400-560(5), “each general order of approval shall include a section on how an applicant is to request coverage and how the permitting authority will grant coverage. The section of the general order of approval will include either the method in (a) or (b) of this subsection to describe the process for the applicant to be granted coverage.”

> “(a) Within thirty days of receipt of an application for coverage under a general order of approval, the permitting authority shall notify an applicant in writing that the application is incomplete, approved, or denied. If an application is incomplete, the permitting authority shall notify an applicant of the information needed to complete the application. If an application is denied, the permitting authority shall notify an applicant of the reasons why the application is denied. Coverage under a general order of approval is effective as of the date of issuance of approval by the permitting authority.”

> “(b) The applicant is approved for coverage under the general order of approval thirty-one days after an application for coverage is received by the permitting authority, unless the owner or operator receives a letter from the permitting authority, postmarked within thirty days of when the application for coverage was received by the permitting authority, notifying the owner or operator that the emissions unit or source does not qualify for coverage under the general order of approval. The letter denying coverage shall notify the applicant of the disqualification and the reasons why coverage is denied.”

Ecology has chosen option (b) for this concrete batch plant general order and these steps are listed in the general order

b. Public Notice

Based on WAC 173-400-560(2) Compliance with WAC 173-400-171 (Public notice and opportunity for public comment) is required for a modification of an existing general order of approval. Therefore, Ecology held a mandatory 30-day public comment period on <start date> through <end date>. Comments and Ecology responses to those comments are provided in Appendix A.

c. State Environmental Policy Act (SEPA)

SEPA authority> issued a <determination of non-significance (DNS)/mitigated determination of non-significance (MDNS)/determination of significance (DS)> on <date> for this Ecology action. However, site specific requirements cannot be performed for as part of this generic general order process because the location of the facilities that will use this general order is not yet known. SEPA Compliance is addressed as part of the application process once an applying facility's location is known. SEPA information is provided to applicants in the application.

An environmental checklist will be submitted with the General Order Application which considered environmental impacts of the project as required by Chapter 43.21C RCW, also known as the State Environmental Policy Act (SEPA). Ecology will review the checklist, make a Determination of Significance or Non-significance and make available for public comment at the same time as a Coverage Approval Order issued for this general order.

3. Applicable Regulations

a. State Regulations

i. Minor New Source Review Applicability

Per WAC 173-400-110, an NOC application and an order of approval must be issued by the permitting authority prior to the establishment of a new source or modification. However, WAC 173-400-560 allows that "In lieu of filing a notice of construction [NOC] application under WAC 173-400-110, the owner or operator may apply for coverage under a general order of approval issued under this section. Coverage under a general order of approval satisfies the requirement for new source review under RCW 70.94.152."

As stated in the general order application and consistent with Ecology's review, the general types of concrete batch emission sources are subject to minor new source review (NSR) via this general order process.

A. Exempt Equipment

Concrete batch plants sometimes share a pit with other sources such as rock crushers or hot mix asphalt plants. While those other sources are exempt from this general order, they will need coverage under their own specific general orders unless they choose to go through the full NOC process.

B. Potential to Emit (Potential Emissions)

The potential emissions from the project are greater than the exemption levels listed under WAC 173-400-110(5) as shown below in Tables 1 and 2 (in bold). See Appendix C for more information about emissions.

Table 1. Potential emissions for pollutants listed under WAC 173-400-110(5), versus the Minor NSR Exemption Levels

Pollutant	(tons/year)	Minor NSR Exemption (tons/year)
Truck Mix PM_{10}	0.23 – 0.67	0.75
Central Mix PM_{10}	0.60 – **2.0**	0.75
Truck Mix $PM_{2.5}$	0.06 -0.1	0.5
Central Mix $PM_{2.5}$	0.2 – 0.3	0.5
Truck Mix total PM	0.6 – **2.10**	1.25
Central Mix total PM	**1.60 – 6.70**	1.25

Ecology is providing a range of values in this table due to emission factor uncertainties. Specifically, based on modeling, and after multiple internal discussions, discussions with local clean air agencies, and EPA, Ecology believes that the only available emission factors for haul roads are unreliable because they are too conservative. For further discussions, see Section 5.a.

For Toxic Air Pollutants (TAPs), Ecology found emission factors for 10 different TAPs from EPA AP 42 11.12 "Concrete Batching..." Of these, four had estimated emissions above de minimis values in WAC 173-460-150.

Table 2. Potential Toxic Air Pollutant (TAP) emissions and de minimis emission values

Pollutant	Potential Emissions from Project (lbs)	De Minimis Emission Values (lbs)	Averaging Period
Truck mix Arsenic and inorganic compounds	**1.54E-02**	2.50E-03	yr
Central mix Arsenic and inorganic compounds	**2.98E-02**	2.50E-03	yr
Truck mix Chromium (VI) and compounds (Turck	**7.06E-04**	3.30E-05	yr
Central mix Chromium (VI) and compounds	**1.69E-04**	3.30E-05	yr
Truck mix Manganese and compounds	**2.66E-02**	1.10E-03	24-hr
Central mix Manganese and compounds	**4.97E-03**	1.10E-03	24-hr

Pollutant	Potential Emissions from Project (lbs)	De Minimis Emission Values (lbs)	Averaging Period
Truck mix Silica, crystalline (respirable)	**1.6 –5.5**	0.011	24-hour
Central mix Silica, crystalline (respirable)	**1.2 – 5.2**	0.011	24-hour

ii. Prevention of Significant Deterioration (PSD)

Based on WAC 173-400-560(4)(a)(iii) General Orders cannot be "part of a new major stationary source or major modification of a major stationary source subject to the [PSD] requirements of …WAC 173-400-700 through 173-400-750…"

iii. Other Applicable Requirements

In accordance with WAC 173-400-113/-112, the proposed source must comply with all applicable emission standards adopted under Chapter 70A.15 RCW. The following applicable emission standards are associated with the proposed project:

A. List applicable emission standards.

- WAC 173-400-040 (General standards for maximum emissions).
- WAC 173-400-050 (Emission standards for combustion and incineration units).
- WAC 173-400-060 (Emission standards for general process units).
- WAC 173-400-070 (Emission standards for certain source categories).
- WAC 173-400-075 (Emission standards for sources emitting hazardous air pollutants).
- WAC 173-400-115 (Standards of performance for new sources).
- WAC 173-400-560 (General Order of Approval).

b. Federal Regulations

In accordance with WAC 173-400-113/-112, the proposed source must comply with all applicable new source performance standards (NSPS) included in 40 C.F.R. Part 60, national emission standards for hazardous air pollutants (NESHAPs) included in 40 C.F.R. Part 61, and NESHAPs for source categories included in 40 C.F.R. Part 63. The following applicable emission standards are associated with the proposed project:

i. Standards of Performance for New Stationary Sources

Not Applicable

ii. National Emission Standards for Hazardous Air Pollutants

Not Applicable

iii. National Emission Standards for Hazardous Air Pollutants for Source Categories

Not Applicable

4. Emissions

a. Emission Factors/Calculations

See Appendix C.

b. Best Available Control Technology (BACT) and Best Available Control Technology for Toxics (tBACT)

BACT is defined in Washington Administrative Code (WAC) 173-400-030(13) as "an emission limitation based on the maximum degree of reduction....from any new or modified stationary source...which the permitting authority, on a case-by-case basis...taking into account energy, environmental, and economic impacts and other costs ..." Therefore, in Washington State, BACT is required not only for major new source review but also for minor new source review.

Ecology's preferred first option for BACT is to implement a presumed or presumptive BACT. The term presumptive BACT is used to convey situations where BACT is determined without explicitly going through (or repeating) the full five-step top-down approach as listed in the October 1990 EPA Draft New Source Review Workshop Manual (or Puzzlebook). It conveys the intent of implementing a review of what similar sources have achieved in practice.

c. BACT is presumed by Ecology as follows:

i. Fugitive particulate matter (PM) from any onsite emission source must be controlled by water application at a rate dependent on the ability to comply with the visible emissions limits of this permit.

ii. PM emissions from loading the cementitious material bin(s) must be vented to a fabric filter (bag house).

iii. PM emissions from in-transit mixing plant truck filling must have enclosed drop chutes and weigh hoppers to minimize wind effects and dropping the concrete components through a flexible boot that fits into the truck mixer.

iv. PM emissions from the weigh hopper (for both truck mix and central mix operations) must be enclosed and vented to a baghouse.

v. PM emissions from central mix plants mixer filling must be controlled by sucking up the PM-laden air in the vicinity of the mixer with a blower and venting it to the cement silo or an independent fabric filter.

vi. BACT for toxic air pollutants (tBACT) is presumed to be the same controls as required for BACT.

d. Allowable Emissions

The allowable emissions from the project, considering all emission controls and operational limits specified by the approval order, are shown in the tables below.

Table 4. Allowable emissions for pollutants listed under WAC 173-400-110(5)

Pollutant	Tons/year
Truck Mix PM_{10}	0.23
Central Mix PM_{10}	0.60
Truck Mix $PM_{2.5}$	0.062
Central Mix $PM_{2.5}$	0.17
Truck Mix total PM	0.6
Central Mix total PM	1.6

Table 5. Allowable TAP emissions

Pollutant		Averaging Period
Truck mix Arsenic and inorganic compounds	**1.54E-02**	yr
Central mix Arsenic and inorganic compounds	**2.98E-02**	yr
Truck mix Chromium (VI) and compounds (Turck	**7.06E-04**	yr
Central mix Chromium (VI) and compounds	**1.69E-04**	yr
Truck mix Manganese and compounds	**2.66E-02**	24-hr
Central mix Manganese and compounds	**4.97E-03**	24-hr
Truck mix Silica, crystalline (respirable)	**1.6**	24-hr
Central mix Silica, crystalline (respirable)	**1.2**	24-hr

As described in the General Order, the terms of WAC 173-400-560 limit the ability to use a General Order for equipment if it is located at a facility that has a Title V permit. If the unit is temporary (365 days or less), the Permittee may be classified as a Title V source. If the unit will be in place for more than 365 days, the Permittee cannot use this General

Order if it is a Title V source. The table below presents the total potential emissions and allowable emissions for facilities that use choose to use this general order.

Table 6. Potential and Allowable Emissions for Total Source

Pollutant	Total Source Potential Emissions (tons/year)	Total Source Allowable Emissions (tons/year)
Truck Mix PM_{10}	0.23 – 0.67	0.23
Central Mix PM_{10}	0.60 – 2.0	0.60
Truck Mix $PM_{2.5}$	0.06 -0.1	0.062
Central Mix $PM_{2.5}$	0.2 – 0.3	0.17
Truck Mix total PM	0.6 – 2.10	0.6
Central Mix total PM	1.60 – 6.70	1.6

5. Ambient Air Quality Standards

As specified in WAC 173-400-113, the proposed new or modified source(s) must not cause or contribute to a violation of any ambient air quality standard. This includes the ambient air quality standards for both criteria and toxic air pollutants.

a. Pollutants Listed Under WAC 173-400-110 (Except TAPs)

Ecology performed modeling to satisfy the requirements of Chapter 173-400-113(3). The modeling demonstrates that the emissions increase as a result of the project will not exceed the ambient air quality standards. The modeling results are included in the table below.

For this modeling analysis, Ecology performed an extensive survey of concrete batch plant data, interviews with Ecology inspectors, multiple concrete batch pit site visits, and the inclusion of haul road emissions. This included initially modeling haul road emissions not only from concrete batch operations but also modeling scenarios that include similar haul road vehicle traffic operating concurrently from other potential operations in the same pit (one rock crusher operation + one hot mix asphalt facility). Ecology used EPA AP-42 haul road emission factor considerations.

Based on modeling, and after multiple internal discussions, and discussion with EPA, Ecology came to the realization that the only available emission factors for haul roads are unreliable because they are too conservative. Therefore, Ecology decided not to include haul roads modeling results for particulate matter emissions. Rather, Ecology has chosen to better address haul road emissions by requiring that haul roads be adequately moist at all times to avoid dust emissions from leaving the property boundary. This approach allows Ecology inspectors discretion by implementing EPA Method 22 and applying it to the property boundary.

Ecology performed modeling at seven pits, each with different ambient impacts. Appendix D Modeling Analysis Summary contains the ambient impact levels and other details for all seven pits, and therefore they are not repeated here. Table 7 summarizes the Appendix D Modeling Analysis which demonstrates that impacts with the general order buffer limits in place will comply with ambient air quality standards.

Table 7. Criteria Pollutant Modeling Results for both Central and Truck-mix.

Criteria Pollutant	Averaging Period	Maximum Modeled Concentration plus Background	Are Maximum Modeled Concentration plus Background below Ambient Air Quality Standards (Yes/No)	Ambient Air Quality Standard (ug/m3)
Carbon Monoxide (CO)	1-hour	Varies between pits (see Appendix D)	Yes	40,000
Carbon Monoxide (CO)	8-hour	Varies between pits (see Appendix D)	Yes	10,000
Nitrogen Oxides (NOX)	Annual	Varies between pits (see Appendix D)	Yes	100
Nitrogen Oxides (NOX)	1-hour	Varies between pits (see Appendix D)	Yes	188
$PM_{2.5}$	24-hr	Varies between pits (see Appendix D)	Yes	35
$PM_{2.5}$	Annual	Varies between pits (see Appendix D)	Yes	9.0
PM_{10}	24-hr	Varies between pits (see Appendix D)	Yes	150
Sulfur Dioxide (SO2)	1-hour	Varies between pits (see Appendix D)	Yes	200

b. Toxic Air Pollutants (TAPs)

In accordance with WAC 173-460-040, TAP sources must meet the requirements of Chapter 173-460 WAC, unless they are exempt by WAC 173-400-110(5).

As shown in Table 2, minor NSR is required for the listed TAPs for concrete batch activities. As such, the concrete batch facility must comply with WAC 173-460-070 (ambient impact requirement). The source may demonstrate compliance with the ambient impact requirement by either showing that the emissions increase is less than the small quantity emissions rates (SQER) or through dispersion modeling. The table below includes the estimated emissions increases associated with the concrete batch activities and the applicable SQER.

Of the four TAPs in Table 2 with estimated emissions above de minimis values, Ecology found three TAPs that are above the SQER and require modeling. The list of TAPs that require modeling are shown in Table 8.

Table 8. TAP Analysis

TAP	Estimated Increase (lbs)	SQER (lbs/avg period)	Modeling Required?
Truck mix Arsenic and inorganic compounds	1.54E-02	4.90E-02	NO
Central mix Arsenic and inorganic compounds	2.98E-02	4.90E-02	NO
Truck mix Chromium (VI) and compounds (Turck	7.06E-04	6.50E-04	YES
Central mix Chromium (VI) and compounds	1.69E-04	6.50E-04	NO
Truck mix Manganese and compounds	2.66E-02	2.20E-02	YES
Central mix Manganese and compounds	4.97E-03	2.20E-02	NO
Truck mix Silica, crystalline (respirable)	1.6	2.20E-01	YES
Central mix Silica, crystalline (respirable)	1.2	2.20E-01	YES

For the list of TAPs in Table 8 that require modeling, Ecology modeled them to satisfy the requirements of Washington's state toxics rule in Chapter 173-460 WAC. The modeling demonstrates that the emissions increases as a result of the project will not exceed the acceptable source impact level (ASIL) screening thresholds. The modeling results are included in the table below.

Table 9. TAP Modeling Results for both Central and Truck-mix

TAP	Averaging Period	Maximum Modeled Concentration (µg/m³)	ASIL (µg/m³)	Below ASIL (Yes/No)?
Chromium (VI) and compounds	yr	Varies between pits (see Appendix D)	4.00E-06	Yes
Manganese and compounds	24-hr	Varies between pits (see Appendix D)	3.00E-01	Yes
Mercury, elemental	24-hr	Varies between pits (see Appendix D)	3.00E-02	Yes
Silica, crystalline (respirable)	24-hr	Varies between pits (see Appendix D)	3.0E+00	Yes

Table 9 summarizes the Appendix D Modeling Analysis which demonstrates that impacts with the general order buffer limits in place are below the associated ASIL. A Second Tier Health Impact Assessment (HIA) was therefore not conducted. Appendix D Modeling Analysis Summary contains the ambient impact levels and other details for all seven pits, and therefore they are not repeated here.

Americans with Disabilities Act Information

Accommodation Requests

To request an ADA accommodation, email aqpubs@ecy.wa.gov, call (360) 407-6800, or dial 711 to call through the Washington Telecommunications Relay for services like text telephone (TTY). Visit Ecology.wa.gov/ADA for more accessibility information

Appendix A – Response to Comments

[Delete this Appendix if there is not a public comment period or if the Response to Comments will be a separate document. If Appendix B is still used be sure to change B to A and update references throughout document.]

[Following public comment period update this Appendix to include comments received and responses. If no comments are received during the comment period, still update this Appendix and state that no comments were received during the comment period.]

This section will be updated following the public comment period.

Appendix B – Federal Rule Applicability

[Delete this Appendix if it's not used.]

a. 40 C.F.R. Part 60

EPA does not have New Source Performance Standard (NSPS) for concrete batch operations, at this time.

Appendix C – Concrete Batch Inputs Summary

Emission Factors**:** [Many of the emission factors referenced below are readily available by the EPA AP-42 "Compilation of Air Emissions Factors from Stationary Sources" website and are therefore not repeated here. Ecology used emission factors from EPA AP-42 11.12 for "Concrete Batching" and other sources where noted below].

a. Transfers:

   Ecology used the controlled scenario emission factors from EPA AP-42 11.12 and background doc Table 19.4 "weigh hopper loading emission factors" and for emission sources listed in Figure 11.12-1. For weigh hoppers, Ecology initially considered factors rated D from EPA AP-42-11.12. However, these emission factors are from an older EPA document ("based on the material transfer equation 1 in EPA AP-42 section 13.2.4, Aggregate Handling and Storage Piles, (1/95) using average amounts of aggregate and sand..."). That document was updated in November 2006 with A rated factors, and was therefore used by Ecology for stockpiles and also for the weigh hopper. Ecology used average wind speed at Grant County airport and used the mid value from EPA AP-42 for moisture content (see values under stockpile below).

b. Truck unloading:

   Ecology assumes rock crushing sand/aggregate factors in EPA AP-42 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing can be used for concrete batch. However, more specific factors where available were used for concrete batching where listed.

c. Truck loading (separate factors for central mix and truck mix):

   Emission factors for truck mix cement plus supplement are 0.028 lb/ton for PM, 0.0105 for PM10, and 0.000392 for PM2.5. Emission factors for central mix cement plus supplement are 0.0212 lb/ton for PM, 0.00577 for PM10, and 0.00297 for PM2.5. Based on North Carolina Department of Environment and Natural Resources. Concrete Batch Plant Emissions Calculator - Input Screen. Revision D; October 15, 2015. PM2.5 emission factors were calculated from PM2.5 ratios to total PM for similar processes.

   Applicable TAP EFs were determined from EPA AP-42 11.12, Table 11.12-8.

d. Cement/Supplement to silo:

   Assumed to be negligible but Ecology added factors per EPA AP-42 11.12, background document Section 4.3 Reference 3. Emission factor from reference is 3.1E-04 lb PM per 1000 lb cement loaded. Or, 6.2E-04 lb PM per ton. Then calculated ratios of supplement or cement PM10 and PM2.5 ratios to total PM from product silo storage emission factors for pulverized mineral processing operations from Table 11.19.2-4 of EPA AP-42 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing.

Applicable TAP EFs were determined from EPA AP-42 11.12, Table 11.12-8.

e. Unpaved haul road estimates:

   i. Silt content percent: Ecology used EPA AP-42 values from 13.2.2 Unpaved Roads. Ecology chose the mean value of 8.3 based on AP-42 Table 13.2.2-1 “Stone quarrying and processing” for the “Haul road to/from pit” option.

   ii. Constant values a, b, and k: Ecology used the values from EPA AP-42 'Table 13.2.2-2. Values vary based on pollutant.

   iii. Weighted fleet average factor of 23 tons: Ecology followed EPA AP-42 13.2.2 for unpaved roads and Ap-42 13.2.1.3 for paved roads: "only one emission factor should be calculated that represents the 'fleet.'" Both empty and full weights of a fleet vehicle, a big loader, and a smaller loader were taken into consideration for the weighted factor.

   iv. Emission factor calculated from equation 1 of EPA AP-42 13.2.2. Values vary based on pollutant.

   v. Rain factor of 90 days based on inspector input of counties regulated by Ecology in eastern and central Washington, taken from EPA AP-42; 13.2.2 Figure 13.2.2-1 “Mean number of days with 0.01 inch or more of precipitation in United States.” Rain credit only applied for annual emission estimate scenarios. Assumed no rain for max hourly and daily emission estimates.

   vi. Gravel, water, and gravel water combination percent control credit of 29/80/86 percent respectively based on inspector input: The gravel value assumes near 100 percent (95%) of gravel control credit. Background documents provided by Olympia Regional Clean Air Agency (ORCAA), OOEPA RACM Table 2.1.1-3 (Ohio), 1980. Ecology assumed a controlled water rate of 80 percent for unpaved roads (every two hours); calculated by ORCAA using equation from EPA/625/5-87/022EPA/625/5-87/022. The combined gravel and water factor equation used is 1-(1-gravel percent)*(1-water percent).

f. Paved haul road estimates:

   i. Silt loading of 8.2 grams per meter squared taken from EPA AP-42 13.2.1 table 13.2.1-3 for stone quarry as the mean value provided. “The term silt loading (sL) refers to the mass of silt-size material (equal to or less than 75 micrometers [µm] in physical diameter) per unit area of the travel surface.”

   ii. Constant value k: Ecology used the values from EPA AP-42 13.2.1 Table 13.2.1-1: "The multiplier k includes unit conversions to produce emission factors in the units shown for the indicated size range from the mixed units required." Values vary based on pollutant.

iii. Weighted fleet average factor of 20 tons: Ecology followed EPA AP-42 13.2.1.3 for paved roads: "only one emission factor should be calculated that represents the 'fleet.'" Both empty and full weights of a fleet vehicle were taken into consideration for the weighted factor.

iv. Emission factor calculated from equation 2 of EPA AP-42 13.2.1.3. Values vary based on pollutant.

v. Rain factor of 90 days based on inspector input of counties regulated by Ecology in eastern and central Washington, taken from EPA AP-42; 13.2.1 Figure 13.2.1-2 “Mean number of days with 0.01 inch or more of precipitation in United States.” Rain credit only applied for annual emission estimate scenarios. Assumed no rain for max hourly and daily emission estimates.

vi. Water control of 75 percent is assumed based on input from Ecology inspectors and ORCAA data for periodic vacuum sweeping.

g. Stockpiles

i. Particle size multiplier constant k value: Ecology used the value from EPA AP-42 13-2-4 Aggregate Handling And Storage Piles. Values vary based on pollutant.

ii. Mean wind speed from Moses Lake Airport (avg mean wind is 7.64 mph) https://weatherspark.com/y/1588/Average-Weather-in-Moses-Lake-Washington-United-States-Year-Round.

iii. Moisture content of 2.5 percent. Ecology used the average value from EPA AP-42 13-2-4 Aggregate Handling And Storage Piles for a “Ranges Of Sources.”

iv. Emission factor calculated from equation 1 of EPA AP-42 13-2-4 Aggregate Handling And Storage Piles. Values vary based on pollutant.

v. Controls: Ecology site visits found some, but not all facilities apply water to aggregate storage piles. Therefore, Ecology assumes 75 percent controls for storage piles, instead of 90 percent control.

h. Throughputs

i. Annual, daily and hourly assumptions:

For initial AERMOD modeling assumptions Ecology assumed annual tonnage of 150,000 (495,000) tons per year for truck-mix (central mix) operations. For both truck mix and central mix operations, Ecology assumed 9,050 tons per day and 1006 tons per hour as starting points for AERMOD modeling. Ecology was prepared to either increase or decrease these amounts depending on the modeling results in order to show compliance with the NAAQS. Only annual and daily limits were included in the permit based on modeling.

As shown in the modeling analysis in Appendix D, distances to NAAQS compliance became the limiting factor regarding siting requirements in the general order. After internal review, Ecology decided to add buffer distance limitations to the general order in order to allow the throughput values listed in the permit. Unless a facility is already covered under a previous Ecology General Order for concrete batch operations, they must apply for a full Notice of Construction permit if they are not able to meet all the limits in the general order. Facilities that can meet all the limits in this general order are welcome to apply for coverage under this general order.

i. Units:

Most of the unit value assumptions were based on a survey of data for Ecology region facilities. While Ecology recognizes that each facility may vary, yet for purposes of calculating emission estimates, Ecology made the following assumptions. Facilities are not required to have the exact number of units below in order to apply for coverage under the general permit.

j. Transfers:

Ecology assumed particulate matter emissions from sand/aggregate unloading, transfer to conveyor, transfer to elevated storage, and transfer to weigh hopper. Ecology assumed additional particulate matter emissions from cement/supplement transfer to silo, and from product loading.

k. Stockpiles:

Ecology assumes one stockpile per site. However, emission estimates are based on throughput instead of the number of stockpiles so that pits with more stockpiles are not ignored.

l. Emission rates

Emission rates derived from the emission factors, throughput values, and number of units are listed within the tables of the main section of this TSD. They were also calculated for the purposes of modeling and are listed in the Appendix D Modeling Analysis Summary.

Because the emission factor for one of the identified TAPs [Silica, crystalline (respirable)], is based on total PM10 emissions, it is listed here as 5.58 percent of total PM10 emissions. This is the mid-range of "...the crystalline silica PM4 emission factors range from 3.21 to 7.95% of the PM10 emission factors." Source: Richards, J. R., Brozell, T. T., Rea, C., Boraston, G., & Hayden, J. (2009). PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California. Journal of the Air & Waste Management Association, 59(11), 1287–1295. https://doi.org/10.3155/1047-3289.59.11.1287.

Estimated emissions of another TAP, was also based on the total calculated emissions of another pollutant. In this case, hexavalent chromium was based on total chromium emissions estimated from EPA AP-42 11.12, Table 11.12-8. Hexavalent chromium in cements was assumed to be "approximately 1% of total chromium content." A. Eštoková, L. Palaščáková, E. Singovszká, M. Holub "Analysis of the chromium concentrations in cement materials" Procedia Engineering 42 (2012) 123-130.

Appendix D – Modeling Analysis Summary

1. Ambient impact analysis to support development of general orders

Ecology conducted air dispersion modeling to estimate ambient impacts of criteria and toxic air pollutants emitted from:

a. Hot mix asphalt plants (HMA)
b. Concrete batch plants (CB)
   i. Central mix
   ii. Truck mix
c. Rock crushers (RC)

We modeled emissions from these source groups at seven pits in different areas of central and eastern WA. Modeling scenarios were based on emissions estimated from numerous activities that occur during the following throughput / production scenarios:

a. HMA plant load out – 310 tons/hour, 2790 tons/day, and 160,554 tons/year
b. CB central mix concrete production - - 500 yd3/hr, 4,500 yd3/day, 246,000 yd3/year
c. CB truck mix concrete production - 500 yd3/hour, 4,500 yd3/day, 74,500 yd3/year
d. RC - 480 tons/hour, 4317 tons/day, and 600,000 tons/year

We relied on our internal modeling guidelines and incorporated methods for modeling fugitive dust sources developed by National Stone, Sand and Gravel Association[1] Annual, daily, or hourly emissions were modeled to estimate ambient impacts relative to the National Ambient Air Quality Standards (NAAQS) and acceptable source impact levels (ASILs). The modeling results from seven locations in central and eastern Washington were used to determine a range of approximate distances from each source group's key emission units to ambient concentrations of criteria pollutants that meet the NAAQS and toxic air pollutants that meet ASILs (Table 1).

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[1] National Stone Sand and Gravel Association. Modeling Fugitive Dust Sources with AERMOD. – Revised January 2007

Distances to NAAQS compliance varied depending on pollutant and location. The range in distances for the various pit locations was partly due to meteorological differences and existing background levels. Relevant to NAAQS, the distances to PM10 compliance were farthest for each source group with the greatest distances of:

a. 100 meters for HMA,
b. 140 meters for CB-central mix,
c. 170 meters for CB-truck mix, and
d. 170 meters for RC

For air toxics, crystalline silica impact distances to the ASIL compliance were even farther than PM10 compliance distances, but the average impacts would be much lower than acceptability criteria under WAC 173-460-090, therefore, distances to PM10 compliance become the limiting factor regarding siting requirements in the general order.

2. Pollutants and relevant standards and ASILs

We considered emissions of PM10, PM2.5, NOx and several toxic air pollutants emitted from hot mix asphalt plants, concrete batch plants, and rock crushers that typically operate within mining pits. We estimated ambient impacts from these pollutants (added to relevant background levels for criteria pollutants)[2] to determine the approximate distances from sources where NAAQS and ASIL compliance is met.

Table 1. Pollutants included in refined air dispersion analysis and their relevant regulatory standards and screening levels

Pollutant	Source Group	Averaging Time	NAAQS Level	NAAQS Form	WA TAP ASIL level
PM2.5	HMA, CB, and RC	1 year	9.0	annual mean, averaged over 3 years	NA
PM2.5	HMA, CB, and RC	24-hr	35	98th percentile, averaged over 3 years	NA
PM10	HMA, CB, and RC	24-hr	150	Not to be exceeded more than once per year on average over 3 years	NA
NO2	HMA	1-hr	188	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years	NA
NO2	HMA	annual	100	annual mean	NA
NO2	HMA	1-hr	NA	NA	4.7E+02

[2] https://idahodeq.maps.arcgis.com/apps/MapSeries/index.html?appid=0c8a006e11fe4ec5939804b873098dfe

Pollutant	Source Group	Averaging Time	NAAQS Level	NAAQS Form	WA TAP ASIL level
Arsenic	HMA	1-year	NA	NA	3.0E-04
Cadmium	HMA	1-year	NA	NA	2.4E-04
Chromium VI	HMA and CB	1-year	NA	NA	4.0E-06
Nickel	HMA	1-year	NA	NA	3.8E-03
Mercury	HMA	24-hr	NA	NA	3.0E-02
Naphthalene	HMA	1-year	NA	NA	2.9E-02
Sulfur dioxide	HMA	1-hr	NA	NA	6.6E+02
Benzene	HMA	1-year	NA	NA	1.3E-01
Formaldehyde	HMA	1-year	NA	NA	1.7E-01
Carbon monoxide	HMA	1-hr	NA	NA	2.3E+04
Crystalline Silica	HMA, CB, and RC	24-hr	NA	NA	3.0E+00

3. Emissions Estimates

Ecology used EPA's Compilation of Air Pollutant Emissions Factors from Stationary Sources (AP-42) to estimate emissions from each source group. The following AP-42 Chapters.

a. 11.1 – Hot mix asphalt plants

b. 11.12 – Concrete batching

c. 11.19 – Crushed stone processing and pulverized mineral processing,

   The assumptions and methods to estimate emissions specific to the development of the general orders are described in the General Order TSD. Emission rates for each source group and activity were converted to units of grams per second (g/s) or grams per second per square meter ($g/s/m^2$) for use in the AERMOD modeling system. Emission rates for each source group are shown in:

d. Table 2 (HMA)

e. Tabel 3 (CB- Central mix)

f. Table 4 (CB- Truck mix)

g. Table 5 (RC)

Table 2. Hot Mix Asphalt emission rates for modeling – $PM_{2.5}$, PM_{10}, and NO_x and crystalline silica

Source Group	Source ID	Source Description	Source type	$PM_{2.5}$ (Annual)	$PM_{2.5}$ (24-hr)	PM_{10} (24-hr)	NO_x	Silica (24-hr)	Units
Hot mix asphalt	A-BGHS	Baghouse	Point	8.14E-04	5.16E-03	2.16E-02	9.01E-01	1.2E-03	g/s
Hot mix asphalt	A-HTR	Heater	Point	1.46E-05	9.28E-05	2.67E-04	3.27E-02	1.5E-05	g/s
Hot mix asphalt	AR-ADGS	Aggregate and RAP Delivery to Ground	Volume	3.10E-06	1.96E-05	1.36E-02	NA	7.6E-04	g/s
Hot mix asphalt	AR-SP1	Aggregate and RAP Storage Pile	Area	0.0	0.0	7.62E-06	NA	4.3E-07	$g/s/m^2$
Hot mix asphalt	A-Transfers	Combined Transfers	Volume	1.73E-04	1.10E-03	3.79E-03	NA	2.1E-04	g/s
Hot mix asphalt	A-PLO	Asphalt drop into trucks	Volume	1.21E-03	7.65E-03	7.65E-03	NA	NA	g/s
Hot mix asphalt	A-SF	Asphalt silo storage	Point	1.35E-03	8.58E-03	8.58E-03	NA	NA	g/s
Hot mix asphalt	A-RCR	Asphalt RAP Crushing	Volume	6.93E-06	4.39E-05	2.37E-04	NA	1.3E-05	g/s
Hot mix asphalt	A-ASCR	Aggregate scalping screen	Volume	9.42E-04	5.97E-03	8.72E-02	NA	4.9E-03	g/s

Table 3. Central Mix Concrete Batch Plant emission rates for modeling – $PM_{2.5}$ and PM_{10} and crystalline silica

Source Group	Source ID	Source Description	Source type	$PM_{2.5}$ (Annual)	$PM_{2.5}$ (24-hr)	PM_{10} (24-hr)	Silica (24-hr)	Units
Concrete Batch – Central Mix	CB_SILO	Cement Supplement Transfer	Point	2.18E-04	1.46E-03	3.88E-03	2.2E-04	g/s
Concrete Batch – Central Mix	CB_TRAN23_24	Sand and Aggregate Transfer to Conveyor	Volume	7.57E-05	5.06E-04	1.75E-03	9.8E-05	g/s
Concrete Batch – Central Mix	CB_TRAN04_05	Aggregate and Sand Transfer to Elevation Bins	Volume	7.57E-05	5.06E-04	1.75E-03	9.8E-05	g/s
Concrete Batch – Central Mix	CB_WH	Weigh Hopper Loading	Volume	1.24E-03	8.26E-03	5.46E-02	3.0E-03	g/s
Concrete Batch – Central Mix	CB_CM09	Central Mix Loading	Volume	2.97E-03	1.98E-02	3.84E-02	2.1E-03	g/s
Concrete Batch – Central Mix	CB_ASP	Aggregate and Sand Pile	Area Circle	9.84E-07	6.59E-06	4.33E-05	7.6E-04	$g/s/m^2$
Concrete Batch – Central Mix	CB_AGG_UL	Aggregate and Sand Delivery to Ground Storage	Volume	2.69E-05	1.80E-04	6.22E-04	3.5E-05	g/s

Table 4. Truck Mix Concrete Batch Plant emission rates for modeling – $PM_{2.5}$ and PM_{10} and crystalline silica

Source Group	Source ID	Source Description	Source type	$PM_{2.5}$ (Annual)	$PM_{2.5}$ (24-hr)	PM_{10} (24-hr)	Silica (24-hr)	Units
Concrete Batch – Truck Mix	CB_SILO	Cement Supplement Transfer	Point	6.60E-05	1.46E-03	3.88E-03	2.2E-04	g/s
Concrete Batch – Truck Mix	CB_TRAN23_24	Sand and Aggregate Transfer to Conveyor	Volume	2.29E-05	5.06E-04	1.75E-03	9.8E-05	g/s
Concrete Batch – Truck Mix	CB_TRAN04_05	Aggregate and Sand Transfer to Elevation Bins	Volume	2.29E-05	5.06E-04	1.75E-03	9.8E-05	g/s
Concrete Batch – Truck Mix	CB_WH	Weigh Hopper Loading	Volume	3.75E-04	8.26E-03	5.46E-02	3.0E-03	g/s
Concrete Batch – Truck Mix	CB_TM	Truck Mix Loading	Volume	1.19E-03	2.61E-02	7.0 E-02	3.9E-03	g/s
Concrete Batch – Truck Mix	CB_ASP	Aggregate and Sand Pile	Area Circle	2.98E-07	6.59-05	4.33E-05	7.6E-04	$g/s/m^2$
Concrete Batch – Truck Mix	CB_AGG_UL	Aggregate and Sand Delivery to Ground Storage	Volume	8.16E-06	1.80E-04	6.22E-04	3.5E-05	g/s

Table 5. Rock Crusher emission rates for modeling – $PM_{2.5}$ and PM_{10} and crystalline silica

Source Group	Source ID	Source Description	Source type	$PM_{2.5}$ (Annual)	$PM_{2.5}$ (24-hr)	PM_{10} (24-hr)	Silica (24-hr)	Units
Rock Crusher	RC_PRCRSH	Primary Crusher	Volume	8.34E-04	2.19E-03	1.18E-02	6.6E-04	g/s
Rock Crusher	RC_SCR1	Screen 1	Volume	4.63E-04	1.22E-03	1.78E-02	9.9E-04	g/s
Rock Crusher	RC_SCR2	Screen 2	Volume	4.63E-04	1.22E-03	1.78E-02	9.9E-04	g/s
Rock Crusher	RC_SCRF	Fine Screen	Volume	1.72E-04	9.04E-04	1.32E-02	7.36E-04	g/s
Rock Crusher	RC_SCRSH	Secondary Crusher	Volume	1.15E-03	2.05E-03	1.09E-02	6.1E-04	g/s
Rock Crusher	RC_TCRSH	Tertiary Crusher	Volume	1.15E-03	2.05E-03	1.09E-02	6.1E-04	g/s
Rock Crusher	RC_SP1	Pre crush/screen storage pile	Area	4.10E-07	1.43E-06	9.45E-06	5.3E-07	$g/s/m^2$
Rock Crusher	RC_SP2	Post crush/screen storage pile	Area	1.95E-08	6.78E-08	4.49E-07	2.5E-08	$g/s/m^2$
Rock Crusher	RC_TRANS	Transfer/load/drop points	Area	6.55E-07	2.02E-06	1.04E-05	5.8E-07	$g/s/m^2$
Rock Crusher	RC_FCRSH	Fines Crusher	Volume	1.98E-04	5.21E-04	8.93E-03	4.98E-04	g/s

Table 6. Emission unit-specific emission rates for TAPs with emissions that exceed SQERs (excluding crystalline silica).

Pollutant	Averaging Time	A-BGHS Emission rate (g/s)	A-HTR Emission rate (g/s)	A-PLO Emission rate (g/s)	A-SFS Emission rate (g/s)	Central Mix CB-SiLO Emission rate (g/s)	Central Mix CB-CM09 Emission rate (g/s)	Truck Mix CB-SiLO Emission rate (g/s)	Truck Mix CB-TM10 Emission rate (g/s)
Arsenic and arsenic inorganic compounds	1-year	1.29E-06	NA	NA	NA	NA	NA	NA	NA
Benzene	1-year	9.01E-04	NA	4.99E-06	9.01E-06	NA	NA	NA	NA
Cadmium and compounds	1-year	9.47E-07	NA	NA	NA	NA	NA	NA	NA
Carbon monoxide	1-hr	4.99E+00	2.98E-03	NA	NA	NA	NA	NA	NA
Chromium (VI) and compounds	1-year	1.04E-06	NA	NA	NA	2.52E-09	1.75E-09	7.64E-10	1.71E-08
Formaldehyde	1-year	7.16E-03	8.69E-06	8.45E-06	1.94E-04	NA	NA	NA	NA
Mercury, elemental	24-hr	3.81E-05	NA	NA	NA	NA	NA	NA	NA
Naphthalene	1-year	1.50E-03	4.22E-05	9.84E-06	1.07E-05	NA	NA	NA	NA
Nickel and compounds	1-year	1.45E-04	NA	NA	NA	NA	NA	NA	NA
Nitrogen dioxide	1-hr	9.0E-01	3.27E-02	NA	NA	NA	NA	NA	NA
Sulfur dioxide	1-hr	1.73E-01	6.33E-05	NA	NA	NA	NA	NA	NA

4. Modeling Methods and Assumptions

We used Lakes Environmental AERMOD View 12.0.0 which incorporates the 23132 version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) modeling system. AERMOD is the EPA's dispersion modeling system typically used to determine impacts from new sources of air pollution. The AERMOD modeling system includes the following key components:

a. AERMOD: the dispersion model;
b. AERMAP: the terrain processor for AERMOD;
c. AERMET: the meteorological data processor for AERMOD;
d. AERMINUTE: pre-processor to AERMET used to calculate hourly average winds from 1-minute ASOS data.
e. AERSURFACE: Land cover data used in AERMET

5. Site Selection and Source layout

Ecology's inspectors identified numerous existing pits/mining areas in central and eastern Washington as settings for conducting ambient impact analyses. Ecology chose the following locations to capture different terrain and meteorology:

a. Hiawatha Pit – near Moses Lake
b. Hutchison Pit – near Ellensburg
c. Chelan Sand and Gravel – near Chelan
d. American Rock – near Pasco
e. Ritzville Pit – near Ritzville
f. Okanogan Valley Concrete – near Okanogan
g. Smith – Dallesport Pit – near Dallesport

The goal of selecting multiple different pits in different areas of the state was to evaluate how different meteorology and terrain affects ambient impacts of sources with similar emissions and physical parameters.

The layout of each of the source groups (hot mix asphalt, concrete batch plant, and rock crushing) was chosen to reflect that of an actual pit in which all three activities occur (the Hiawatha Pit near Moses Lake, WA). This source configuration was kept consistent between each modeled location so that appropriate comparisons could be made.

UTM coordinates are used in the AERMOD system to denote geographic location of sources and receptors. Ecology determined the UTM coordinates (NAD83 Zones 10 and 11 depending on location in central or eastern WA) at the approximate center of each of the pits that we identified for modeling.

6. Source / Stack Parameters

Ecology identified physical parameters for each of the key emission sources. These parameters were based on existing source test data and best professional judgment and are shown in:

a. Table 7 (HMA)
b. Table 8 (CB)
c. Table 9 (RC)

Table 7. Physical modeling parameters for Hot Mix Asphalt sources

Source Group	Source ID	Source Description	Source type	Release Height (m)	Length of side (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)	Exhaust Temperature (C)	Stack Inside Diameter (m)	Gas exit velocity (m/sec)
Hot mix asphalt	A-ASCR	Aggregate scalping screen	Volume	5.79	1.7	0.4	2.68	NA	NA	NA
Hot mix asphalt	A-BGHS	Baghouse	Point	11.23	NA	NA	NA	93.85	1.44	36.63
Hot mix asphalt	A-HTR	Heater	Point	3.66	NA	NA	NA	175.83	0.25	3.54
Hot mix asphalt	AR-ADGS	Aggregate and RAP Delivery to Ground	Volume	6.17	6.9	1.6	2.2	NA	NA	NA
Hot mix asphalt	AR-SP1	Aggregate and RAP Storage Pile	Area	1.8	60.96 x 60.96 oriented at 0 deg from north	NA	NA	NA	NA	NA
Hot mix asphalt	A-Transfers	Combined Transfers	Volume	4.46	1.38	0.32	1.85	NA	NA	NA
Hot mix asphalt	A-PLO	Asphalt drop into trucks	Volume	7.5	1.85	0.43	0.14	NA	NA	NA
Hot mix asphalt	A-SF	Asphalt silo storage	Point	19.51	NA	NA	NA	180.78	0.3	0.001

Source Group	Source ID	Source Description	Source type	Release Height (m)	Length of side (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)	Exhaust Temperature (C)	Stack Inside Diameter (m)	Gas exit velocity (m/sec)
Hot mix asphalt	A-RCR	Asphalt RAP Crushing	Volume	1.52	1.85	0.43	0.35	NA	NA	NA

Table 8. Physical modeling parameters for Concrete Batch Plant sources

Source Group	Source ID	Source Description	Source type	Release Height (m)	Length of side (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)	Exhaust Temperature (C)	Stack Inside Diameter (m)	Gas exit velocity (m/sec)
Concrete Batch	CB_AGG_UL	Aggregate and Sand Delivery to Ground Storage	Volume	6.2	6.9	1.6	2.2	NA	NA	NA
Concrete Batch	CB_ASP	Aggregate and Sand Pile	Area Circle	3.8	10 m radius of circle	NA	NA	NA	NA	NA
Concrete Batch	CB_CM09	Central Mix Loading	Volume	3.75	1.95	0.45	0.93	NA	NA	NA
Concrete Batch	CB_SILO	Cement Supplement Transfer	Point	12.2	NA	NA	NA	Ambient	0.32	4.0
Concrete Batch	CB_TM	Truck Mix Loading	Volume	3.75	1.95	0.45	0.93	NA	NA	NA

Source Group	Source ID	Source Description	Source type	Release Height (m)	Length of side (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)	Exhaust Temperature (C)	Stack Inside Diameter (m)	Gas exit velocity (m/sec)
Concrete Batch	CB_TRAN 04_05	Aggregate and Sand Transfer to Elevation Bins	Volume	8.1	3.05	0.71	0.43	NA	NA	NA
Concrete Batch	CB_TRAN 23_24	Sand and Aggregate Transfer to Conveyor	Volume	3.5	3.65	0.85	0.43	NA	NA	NA
Concrete Batch	CB_WH	Weigh Hopper Loading	Volume	4.72	3.65	0.85	0.14	NA	NA	NA

Table 9. Physical modeling parameters for Rock Crusher sources

Source Group	Source ID	Source Description	Source type	Release Height (m)	Length of side (m)	Initial Vertical Dimension (m)
Rock Crusher	RC_PRCRSH	Primary Crusher	Volume	4.3	1.66	1.0
Rock Crusher	RC_SCR1	Screen 1	Volume	5.0	2.0	1.16
Rock Crusher	RC_SCR2	Screen 2	Volume	5.0	2.0	1.16
Rock Crusher	RC_SCRF	Fine Screen	Volume	5.0	2.0	1.16
Rock Crusher	RC_SCRSH	Secondary Crusher	Volume	4.3	1.7	1.0
Rock Crusher	RC_TCRSH	Tertiary Crusher	Volume	4.3	1.7	1.0
Rock Crusher	RC_SP1	Pre-crush / screen storage pile	Area	3.0	58	NA
Rock Crusher	RC_SP2	Post-crush / screen storage pile	Area	3	133	NA
Rock Crusher	RC_Trans	Transfer / load/ drop points	Area	1.5	67	NA
Rock Crusher	RC_FCRSH	Fines Crusher	Volume	4.3	1.7	1.0

7. Receptor Grid

Ecology use a multi-tiered receptor grid consistent with that required of applicants conducting analyses for new sources of air pollution (Table 10).[3] One exception is that the receptor grid was constrained to a six km by six km domain instead of a 10 km by 10 km grid. This was done to reduce model run times and because we anticipated ambient impacts to be at levels of concern in areas relatively close to the sources as they mostly emit pollutants at low release heights. The receptor grid consisted of 4400 receptors, each with a unique UTM coordinate. We set the flagpole height of each receptor at 1.5 meters to approximate the breathing zone of people. Figure 1 shows the receptor grid relative to the Hutchison Pit near Ellensburg.

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[3] https://apps.ecology.wa.gov/publications/documents/0802025.pdf

Table 10. Multi-tiered receptor grid used in dispersion model

Distance from center (m)	Grid spacing (m)
0- 150	12.5
150- 400	25
400 - 900	50
900 - 2000	100
2000 - 3000	300

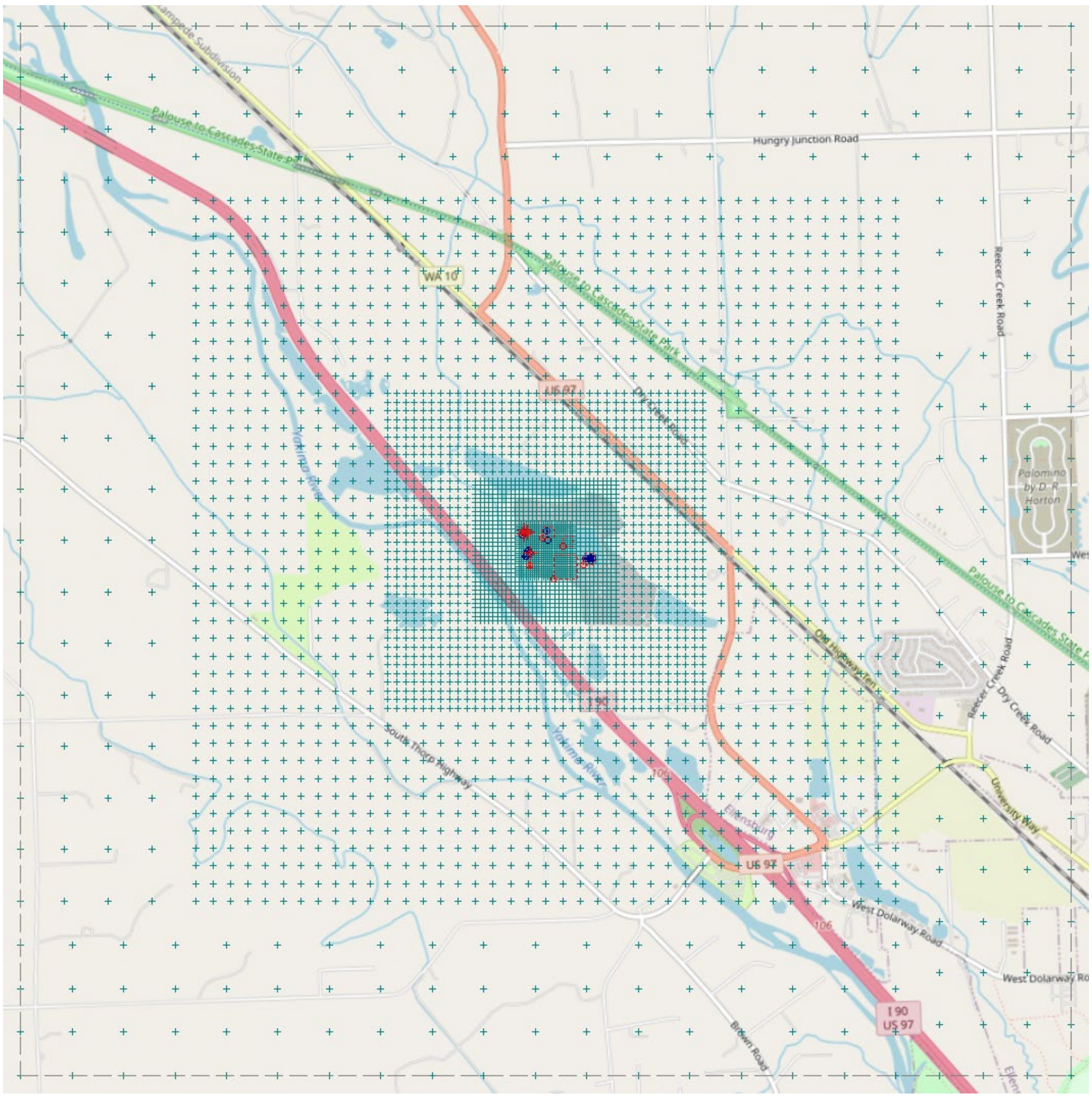


Figure 1. Example of receptor grid layout – Hutchison Pit near Ellensburg

8. Terrain

Terrain was processed in AERMAP using National Elevation Datasets supplied by the United State Geological Survey (USGS). AERMAP uses topographic data to estimate surface elevations of sources and receptors within the modeling domain.

9. Meteorology

AERMET version 23132 was used to process five years of meteorological data (2017 through 2021) from seven sites in central and eastern WA. Meteorological data consist of hourly surface observations such as wind speed, wind direction, and temperature. Generally, we selected five years of consecutive meteorological data from a representative National Weather Service (NWS) Automated Surface Observing System (ASOS) site.

We processed meteorology from ASOS sites nearest the pit locations of interest. 1-min ASOS data using AERMINUTE were also processed to minimize calm hours. Table 11 shows the meteorological stations and the corresponding percent of calm conditions and missing data. Our minimum requirement for data sufficiency is that the meteorological data set contains less than 10 percent calm hours with over 90 percent data completeness.

Upper air data from Spokane during the same time (2017-2021) were also processed through AERMET. These twice-daily upper air sounding measurements provide information regarding meteorological parameters at various elevations above ground.

Surface characteristics based on land used data were obtained using 2016 USGS National Land Cover Data. These data were processed using AERSURFACE to identify surface roughness, Bowen ratio, and albedo within 12- 30 degree sectors surrounding the meteorological observation site.

Table 11. Meteorological stations used in dispersion modeling and the percentage of calm and missing data.

Location	Hours Missing Data 2017 – 2021 (%)	Hours Calm Data 2017 – 2021 (%)
Dallesport - The Dalles - Columbia Gorge Regional/The Dalles Municipal Airport,	420 (0.96%)	681 (1.55%)
Ellensburg – Bowers Field Airport	768 (1.75%)	697 (1.59%)
Moses Lake – Grant County International Airport	435 (0.99%)	763 (1.73%)
Omak – Omak Airport	621 (1.42%)	1246 (2.84%)
Pasco – Tri Cities Airport	366 (0.88%)	499 (1.14%)
Spokane - Spokane International Airport	364 (0.83%)	309 (0.70%)
Wenatchee (East) – Pangborn Memorial Airport	513 (1.17%)	802 (1.83%)

10. Background Concentrations

Ecology used the NW AIRQUEST criteria pollutant background concentration lookup tool to determine background concentrations relevant to different areas of central and eastern WA.[4] The background concentration lookup tool relies on model and monitoring data from July 2014 through June 2017 to estimate background concentrations of criteria pollutant design values for use in air permitting decisions. We selected background levels at coordinates relevant to each of the pit site locations (Table 12).

Table 12. Background $PM_{2.5}$, PM_{10}, and NO_2 levels (mg/m^3) at each site.

Pit Name	City or nearest city	Background Level Lat/Long Coordinates	$PM_{2.5}$ Annual Background Level (mg/m^3)	$PM_{2.5}$ 24-hr Background Level (mg/m^3)	PM_{10} 24-hr Background Level (mg/m^3)	NO_2 Annual Background Level (mg/m^3)	NO_2 1 hr Background Level (mg/m^3)
Hiawatha	Moses Lake	47.13, -119.47	5.7	18.4	82.9	4.1	21.1
American Rock	Pasco	46.27, -119.28	6.6	19.6	81.1	16.4	76.3
Chelan Sand and Gravel	Chelan	47.88, -119.95	4.5	11.9	70.3	2.4	10.9
Hutchison	Ellensburg	47.03, -120.62	5.7	25.5	62.4	11.1	61.2
Ritzville	Ritzville	47.15, -118.32	5.3	15.4	89.7	6.4	32.2
Okanogan Valley Concrete	Okanogan	48.36, -119.60	6.6	26.2	78.6	2.4	11.5
Smith	Dallesport	45.61, -121.16	6.3	20.2	75.0	11.7	51.2

11. Modeling Results

For each source group and emissions scenario, we determined the ambient impact concentration that would meet the NAAQS (considering background concentrations) or ASILs. Then we modeled to determine the area in which the NAAQS or ASIL would be met. We used the AERMOD results to determine approximate distances from the key emission

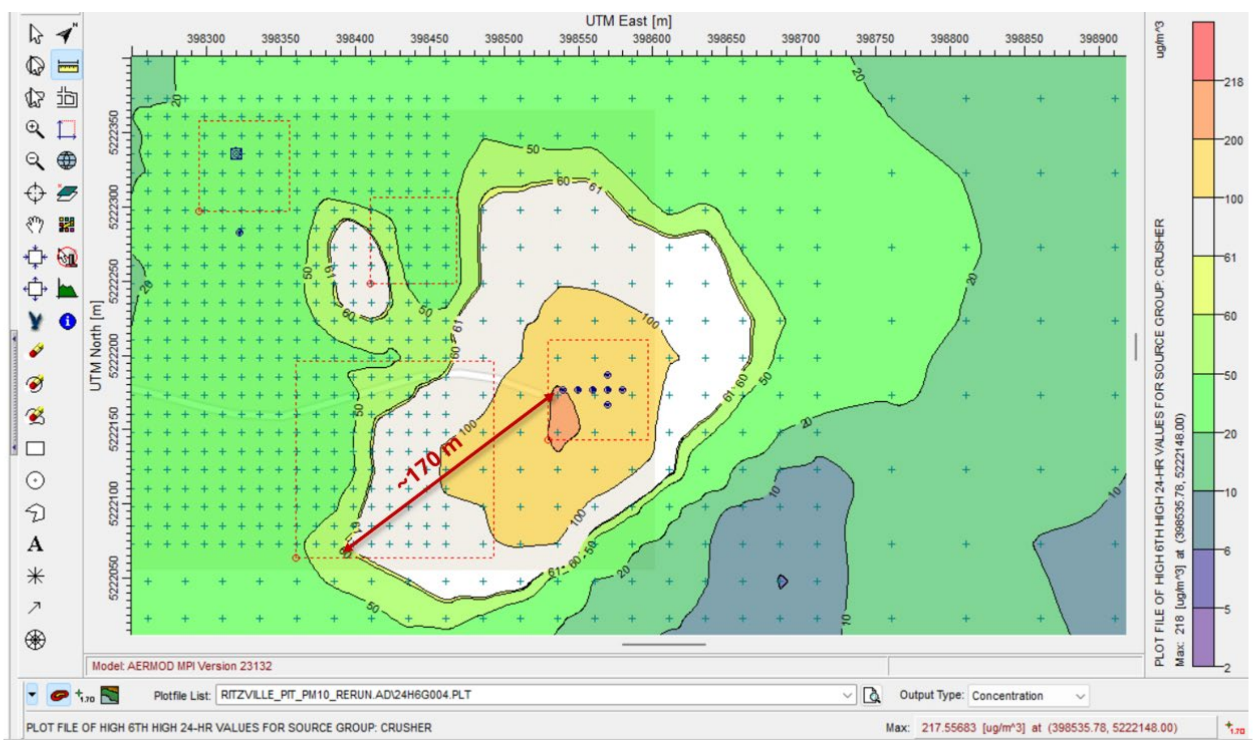
[4] https://lar.wsu.edu/nw-airquest/

units at hot mix asphalt plants, concrete batch plants, and rock crushers to the locations where relevant NAAQS and ASILs would be met for each scenario. Using the measurement tool in AERMOD View, we estimated the distance from the key emission units to the isopleth at which NAAQS or ASIL compliance was achieved. These measurements are intended to inform the distance that emission units should be sited from the ambient boundary or sensitive receptors. Figure 2 shows an example of how these measurements were made.

Table 13. Model output vaues used for comparison with NAAQS or ASILs

Pollutant	Model output value used for comparison to NAAQS
PM_{10}	6th highest PM_{10} 24-hr concentration over five year period
$PM_{2.5}$	average 8th high 24-hr concentration over three year period
$PM_{2.5}$	annual mean, averaged over three years
NO_2	annual mean
NO_2	Maximum one hour as a worst-case comparison. If screening values failed NAAQS compliance, then the model was rerun to obtain the 8th high maximum daily one hour concentration averaged over three years for direct comparison to the NAAQS
Air toxics	Maximum concentration at toxic air pollutant specific averaging time in WAC 173-460-150

Figure 2. Example – determining distance to compliance with NAAQS or ASILs



12. Hot mix asphalt – modeling results

Tables 14 to 19 show the modeling results and distances to relevant NAAQS or ASIL compliance for HMA plants at each location. The farthest distance to NAAQS compliance is 100 m for PM_{10} at the Ritzville Pit. Distances to crystalline silica ASIL compliance were even greater (up to 280 m) but the average impacts would meet approvability criteria under WAC 173-460-090. The following ranges of distances to NAAQS or ASIL compliance are shown below:

PM_{10} –50 to 100 m

Daily $PM_{2.5}$ – 0 to 30 m

Annual $PM_{2.5}$ – 0 m

1hr NO_2 – 0 m

Annual NO_2 – 0 m

a. Air Toxics
    i. Arsenic - 0 m
    ii. Benzene - 0 m
    iii. Cadmium - 0 m
    iv. Chromium (VI) and compounds - 0 m
    v. Mercury, elemental - 0 m
    vi. Naphthalene - 0 m
    vii. Nickel and Compounds - 0 m
    viii. Nitrogen Dioxide - 0 m
    ix. Sulfur Dioxide - 0 m
    x. Crystalline Silica
        A. (first-tier review) – 90 to 280 m
        B. (second tier review) – 0 m

Table 14. Summary of modeled PM_{10} concentrations , background levels, and distance from key hot mix asphalt emission units to point of NAAQS compliance

HMA - PM_{10}	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
PM_{10} (N+1 highest) 24-hr PM concentration (mg/m^3) – point of maximum impact	216.6	203.8	195.3	350.3	355.5	694.6	273.3
PM_{10} background design value (mg/m^3)	81.1	70.3	82.9	62.4	78.6	89.7	75.0
PM_{10} (sum of project and background) (mg/m^3)	297.7	274.1	278.2	412.7	434.1	784.3	348.3
PM_{10} NAAQS (mg/m^3)	150	150	150	150	150	150	150
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No
PM_{10} impact level to meet NAAQS (mg/m^3)	68.9	79.7	67.1	87.6	71.4	60.3	75.0
Distance from key emission units to NAAQS compliance (m)	70	50	60	50	60	100	70

Table 15. Summary of modeled daily $PM_{2.5}$ concentrations , background levels, and distance from key hot mix asphalt emission units to point of NAAQS compliance

HMA – Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ 24-hr (8th high) (mg/m^3)– point of maximum impact	12.1	11.8	8.5	20.1	16.4	28.9	14.9
$PM_{2.5}$ background design value (mg/m^3)	19.6	11.9	18.4	25.5	26.2	15.6	20.2
$PM_{2.5}$ (sum of project and background) (mg/m^3)	32	24	27	46	43	45	35
$PM_{2.5}$ NAAQS (mg/m^3)	35	35	35	35	35	35	35
NAAQS met at point of maximum impact?	Yes	Yes	Yes	No	No	No	Yes
$PM_{2.5}$ impact level to meet NAAQS (mg/m^3)	15.4	23.1	16.6	9.5	8.9	19.4	14.8
Distance from key emission units to NAAQS compliance (m)	0	0	0	30	20	10	0

Table 16. Summary of modeled annual $PM_{2.5}$ concentrations , background levels, and distance from key hot mix asphalt emission units to point of NAAQS compliance

HMA – Annual $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ annual concentration (mg/m^3)– point of maximum impact	0.7	1.0	0.6	0.7	0.9	0.8	0.7
$PM_{2.5}$ background design value (mg/m^3)	6.6	4.5	5.7	5.7	6.6	5.3	6.3
$PM_{2.5}$ (sum of project and background) (mg/m^3)	7.3	5.4	6.3	6.4	7.4	6.1	7.0
$PM_{2.5}$ NAAQS (mg/m^3)	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NAAQS met at point of maximum impact?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 17. Summary of modeled 1-hr NO_2 concentrations, background levels, and total concentrations relative to the NAAQS - hot mix asphalt

HMA – 1-hr NO_2	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
NO_2 maximum 1-hr concentration (mg/m^3) assuming	147	169	97.8	48.8	77.0	64.0	126

HMA – 1-hr NO_2	**American Rock**	**Chelan Sand and Gravel**	**Hiawatha**	**Huthison Pit**	**Okanogan Valley Concrete**	**Ritzville Pit**	**Smith-Dallesport**
100% Nox = NO_2							
NO_2 1-hr (8th high) concentration (mg/m^3) – point of maximum impact ARM2	80.2	NA	NA	NA	NA	NA	NA
NO_2 background design value (mg/m^3)	76.3	10.9	21.1	61.2	11.5	32.2	51.2
NO_2 (sum of project and background) (mg/m^3)	156.5	179.9	118.9	100	88.5	96.2	177.2
NO_2 1-hr NAAQS (mg/m^3)	188	188	188	188	188	188	188
NAAQS met at point of maximum impact?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 18. Summary of modeled annual NO_2 concentrations, background levels, and total concentrations relative to the NAAQS - hot mix asphalt

HMA – annual NO_2	**American Rock**	**Chelan Sand and Gravel**	**Hiawatha**	**Huthison Pit**	**Okanogan Valley Concrete**	**Ritzville Pit**	**Smith-Dallesport**
NO_2 maximum annual average concentration	0.23				0.58	0.31	0.45

HMA – annual NO_2	**American Rock**	**Chelan Sand and Gravel**	**Hiawatha**	**Huthison Pit**	**Okanogan Valley Concrete**	**Ritzville Pit**	**Smith-Dallesport**
(mg/m^3) 100% NO_x = NO_2							
NO_2 background design value (mg/m^3)	4.1	16.4	2.4	11.1	6.4	2.4	11.7
NO_2 (sum of project and background) (mg/m^3)	4.3				7.0	2.7	12.2
NO_2 annual NAAQS (mg/m^3)	100	100	100	100	100	100	100
NAAQS met at point of maximum impact?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 19. Summary of modeled air toxics concentrations and distance from key hot mix asphalt emission units to ASIL compliance

HMA – air toxics	**Avg Time**	**ASIL** (mg/m^3)	**American Rock** (mg/m^3)	**Chelan Sand and Gravel** (mg/m^3)	**Hiawatha** (mg/m^3)	**Huthison Pit** (mg/m^3)	**Okanogan Valley Concrete** (mg/m^3)	**Ritzville Pit** (mg/m^3)	**Smith-Dallesport** (mg/m^3)
Arsenic	yr	3.0E-04	5.5E-07	1.8E-06	4.9E-07	3.1E-06	6.8E-07	6.7E-07	1.1E-06
Benzene	yr	1.3E-01	9.0E-04	1.3E-03	7.6E-04	2.3E-03	7.9E-04	5.8E-04	9.5E-04
Cadmium	yr	2.4E-04	4.1E-07	1.3E-06	3.6E-07	2.3E-06	5.0E-07	4.9E-07	8.3E-07
Chromium (VI) and compounds	yr	4.0E-06	4.5E-07	1.4E-06	4.0E-07	2.5E-06	5.5E-07	5.4E-07	9.1E-07
Mercury, elemental	24-hr	3.0E-02	2.6E-04	8.2E-04	4.4E-04	5.3E-04	4.4E-04	3.3E-04	3.1E-04
Naphthalene	yr	2.9E-02	5.6E-03	1.0E-02	7.2E-03	1.6E-02	1.3E-02	6.7E-03	1.0E-02
Nickel and Compounds	yr	3.8E-03	6.2E-05	2.0E-04	5.6E-05	3.5E-04	7.6E-05	7.6E-05	1.3E-04
Nitrogen Dioxide	1-hr	4.70E+02	1.5E+02	1.7E+02	9.8E+01	4.9E+01	7.7E+01	6.4E+01	1.3E+02
Sulfur Dioxide	1-hr	6.60E+02	5.8E+00	3.1E+01	5.0E+00	5.4E+00	1.1E+01	4.0E+00	7.0E+00
Crystalline Silica	24-hr	3.0E+00	1.8E+01	1.8E+01	2.1E+01	1.8E+01	3.1E+01	5.2E+01	2.5E+01
Distance from key emission units to Crystalline Silica ASIL compliance (m)	-	-	280	90	120	110	120	150	120

13. Central Mix Concrete Batch Plant – modeling results

Tables 20 to 23 show the modeling results and distances to relevant NAAQS or ASIL compliance for Central Mix Concrete Batch Plants at each location. The farthest distance to NAAQS compliance is 140 m for PM_{10} at the Ritzville Pit. Distances to crystalline silica ASIL compliance were even greater (up to 190 m) but the average impacts would meet approvability criteria under WAC 173-460-090. The following ranges of distances to NAAQS or ASIL compliance are shown below:

PM_{10} –70 to 140 m

Daily $PM_{2.5}$ – 60 to 120 m

Annual $PM_{2.5}$ – 0 to 20 m

a. Air Toxics

   i. Chromium (VI) and compounds -0 m

   ii. Crystalline Silica

      A. (first-tier review - 120 to 190 m

      B. (second tier review) – 0 m

Table 20. Summary of modeled PM_{10} concentrations, background levels, and distance from key central mix concrete batch plant emission units to point of NAAQS compliance

CB – Central Mix: PM_{10}	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
PM_{10} (N+1 highest) 24-hr PM concentration (mg/m^3) – point of maximum impact	316.2	289.8	164.7	527.4	664.6	508.7	190.5
PM_{10} background design value (mg/m^3)	81.1	70.3	82.9	62.4	78.6	89.7	75.0
PM_{10} (sum of project and background) (mg/m^3)	397.3	360.1	247.6	589.8	743.2	598.4	265.5
PM_{10} NAAQS (mg/m^3)	150	150	150	150	150	150	150
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No
PM_{10} impact level to meet NAAQS (mg/m^3)	68.9	79.7	67.1	87.6	71.4	60.3	75.0

CB – Central Mix: PM_{10}	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
Distance from key emission units to NAAQS compliance	140	80	120	70	80	140	100

Table 21. Summary of modeled daily $PM_{2.5}$ concentrations , background levels,and distance from key central mix concrete batch plant emission units to point of NAAQS compliance

CB – Central Mix: Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ Maximum impact 24-hr (8th high) (mg/m^3) – point of maximum impact	127.9	85.2	33.0	194.0	102.6	187.5	67.1
$PM_{2.5}$ background design value (mg/m^3)	19.6	11.9	18.4	25.5	26.2	15.6	20.2
$PM_{2.5}$ (sum of project and background) (mg/m^3)	148	97	51	220	129	203	87
$PM_{2.5}$ NAAQS (mg/m^3)	35	35	35	35	35	35	35
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No

CB – Central Mix: Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ impact level to meet NAAQS (mg/m^3)	15.4	23.1	16.6	9.5	8.9	19.4	14.8
Distance from key emission units to NAAQS compliance	120	60	70	50	110	100	100

Table 22. Summary of modeled annual $PM_{2.5}$ concentrations , background levels,and distance from key central mix concrete batch plant emission units to point of NAAQS compliance

CB – Central Mix: Annual $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ Maximum impact annual concentration (mg/m^3) – point of maximum impact	6.1	5.9	2.6	4.5	6.2	2.8	4.2
$PM_{2.5}$ background design value (mg/m^3)	6.6	4.5	5.7	5.7	6.6	5.3	6.3
$PM_{2.5}$ (sum of project and background) (mg/m^3)	12.8	10.4	8.2	10.1	12.7	8.1	10.5
$PM_{2.5}$ NAAQS (mg/m^3)	9.0	9.0	9.0	9.0	9.0	9.0	9.0

CB – Central Mix: Annual $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
NAAQS met at point of maximum impact?	No	No	Yes	No	No	Yes	No
$PM_{2.5}$ impact level to meet NAAQS (mg/m^3)	2.4	4.5	3.3	3.3	2.4	3.8	2.7
Distance from key emission units to NAAQS compliance	20	20	0	20	20	0	20

Table 23. Summary of modeled air toxics concentrations , background levels, and distance from key central mix concrete batch plant emission units to point of ASIL compliance

CB – Central Mix: Air Toxics	Avg Time	ASIL (mg/m^3)	American Rock (mg/m^3)	Chelan Sand and Gravel (mg/m^3)	Hiawatha (mg/m^3)	Huthison Pit (mg/m^3)	Okanogan Valley Concrete (mg/m^3)	Ritzville Pit (mg/m^3)	Smith-Dallesport (mg/m^3)
Chromium (VI) and compounds	yr	4.0E-06	1.3E-06	1.4E-06	8.3E-07	8.4E-07	1.4E-06	8.8E-07	1.3E-06
Crystalline Silica	24-hr	3.0E+00	2.5E+01	2.5E+01	2.0E+01	2.1E+01	5.0E+01	3.9E+01	1.8E+01
Distance from key emission units to Crystalline Silica ASIL compliance	-	-	180	160	190	120	150	190	130

14. Truck Mix Concrete Batch Plant – modeling results

Tables 24to 27 show the modeling results and distances to relevant NAAQS or ASIL compliance for Truck Mix Concrete Batch Plants at each location. The farthest distance to NAAQS compliance is 170 m for PM_{10} at the Ritzville Pit. Distances to crystalline silica ASIL compliance were even greater (up to 240 m) but the average impacts would meet approvability criteria under WAC 173-460-090. The following ranges of distances to NAAQS or ASIL compliance are shown below:

PM_{10} –80 to 170 m

Daily $PM_{2.5}$ – 70 to 160 m

Annual $PM_{2.5}$ – 0 m

a. Air Toxics
   i. Chromium (VI) and compounds 30 m to 60 m
   ii. Crystalline Silica
      A. (first-tier review -130 to 240 m
      B. (second tier review) – 0 m

Table 24. Summary of modeled PM_{10} concentrations , background levels, and distance from key truck mix concrete batch plant emission units to point of NAAQS compliance

CB – Truck Mix: PM_{10}	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
PM_{10} (N+1 highest) 24-hr PM concentration (ug/m3) – point of maximum impact	1262.9	557.8	257.9	2916.3	1386.2	1577.0	483.0
PM_{10} background design value (ug/m3)	81.1	70.3	82.9	62.4	78.6	89.7	75.0
PM_{10} (sum of project and background) (ug/m3)	1344.0	628.1	340.8	2978.7	1464.8	1666.7	558.0
PM_{10} NAAQS	150.0	150.0	150.0	150.0	150.0	150.0	150.0
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No
PM_{10} impact level to meet NAAQS	68.9	79.7	67.1	87.6	71.4	60.3	75.0
Distance from key emission units to NAAQS compliance	160	100	140	80	100	170	120

Table 25. Summary of modeled daily $PM_{2.5}$ concentrations , background levels, and distance from key truck mix concrete batch plant emission units to point of NAAQS compliance

CB – Truck Mix: Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ Maximum impact 24-hr (8th high) ug/m3 – point of maximum impact	144.9	129.0	39.9	887.8	316.5	550.9	119.7
$PM_{2.5}$ background design value (ug/m3)	19.6	11.9	18.4	25.5	26.2	15.6	20.2

CB – Truck Mix: Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ (sum of project and background) (ug/m3)	165	141	58	913	343	566	140
$PM_{2.5}$ NAAQS	35	35	35	35	35	35	35
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No
$PM_{2.5}$ impact level to meet NAAQS	15.4	23.1	16.6	9.5	8.9	19.4	14.8
Distance from key emission units to NAAQS compliance	150	80	100	65	120	160	120

Table 26. Summary of modeled annual $PM_{2.5}$ concentrations , background levels, and distance from key truck mix concrete batch plant emission units to point of NAAQS compliance

CB – Truck Mix: Annual $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ Maximum impact 24-hr (8th high) ug/m3 – point of maximum impact	2.0	3.2	1.2	2.1	2.0	1.2	1.5
$PM_{2.5}$ background design value (ug/m3)	6.6	4.5	5.7	5.7	6.6	5.3	6.3
$PM_{2.5}$ (sum of project and background) (ug/m3)	8.7	7.6	6.8	7.8	8.5	6.5	7.8
$PM_{2.5}$ NAAQS	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NAAQS met at point of maximum impact?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 27. Summary of modeled air toxics concentrations , background levels, and distance from key truck mix concrete batch plant emission units to point of ASIL compliance

CB – Truck Mix: Air Toxics	**Avg Time**	**ASIL** (mg/m^3)	**American Rock** (mg/m^3)	**Chelan Sand and Gravel** (mg/m^3)	**Hiawatha** (mg/m^3)	**Huthison Pit** (mg/m^3)	**Okanogan Valley Concrete** (mg/m^3)	**Ritzville Pit** (mg/m^3)	**Smith-Dallesport** (mg/m^3)
Chromium (VI) and compounds	yr	4.0E-06	1.9E-05	1.4E-05	8.9E-06	8.3E-06	2.0E-05	7.8E-06	1.2E-05
Crystalline Silica	24-hr	3.0E+00	4.5E+01	4.2E+01	2.6E+01	4.0E+01	1.3E+02	1.3E+02	3.7+01
Distance from key emission units to Chromium (VI) and compounds ASIL compliance	-	-	60	60	50	50	40	30	50
Distance from key emission units to Crystalline Silica ASIL compliance	-	-	220	130	200	150	130	240	170

15. Rock Crusher – modeling results

Tables 28 to 31 show the modeling results and distances to relevant NAAQS or ASIL compliance for Central Mix Concrete Batch Plants at each location. The farthest distance to NAAQS compliance is 170 m for PM_{10} at the Ritzville Pit. Distances to crystalline silica ASIL compliance were even greater (up to 260 m) but the average impacts would meet approvability criteria under WAC 173-460-090. The following ranges of distances to NAAQS or ASIL compliance are shown below:

PM_{10} –70 to 170 m

Daily $PM_{2.5}$ – 0 to 80 m

Annual $PM_{2.5}$ – 20 to 60 m

a. Air Toxics

   i. Crystalline Silica

      A. (first-tier review) -110 to 260 m

      B. (second tier review) – 0 m

Table 28. Summary of modeled PM_{10} concentrations , background levels, and distance from key rock crusher emission units to point of NAAQS compliance

RC- PM_{10}	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
PM_{10} (N+1 highest) 24-hr PM concentration (ug/m3) – point of maximum impact	335.6	183.9	229.0	291.7	286.0	217.6	373.2
PM_{10} background design value (ug/m3)	81.1	70.3	82.9	62.4	78.6	89.7	75.0
PM_{10} (sum of project and background) (ug/m3)	416.7	254.2	311.9	354.1	364.6	307.3	448.2
PM_{10} NAAQS	150.0	150.0	150.0	150.0	150.0	150.0	150.0
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No
PM_{10} impact level to meet NAAQS	68.9	79.7	67.1	87.6	71.4	60.3	75.0
Distance from key emission units to NAAQS compliance	140	70	120	70	110	170	100

Table 29. Summary of modeled daily $PM_{2.5}$ concentrations , background levels, and distance from key rock crusher emission units to point of NAAQS compliance

RC- Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ Maximum impact 24-hr (8th high) ug/m3 – point of maximum impact	41.2	19.8	34.3	43.9	36.7	29.9	52.3
$PM_{2.5}$ background design value (ug/m3)	19.6	11.9	18.4	25.5	26.2	15.6	20.2
$PM_{2.5}$ (sum of project and background) (ug/m3)	61	32	53	69	63	46	72
$PM_{2.5}$ NAAQS	35	35	35	35	35	35	35
NAAQS met at point of maximum impact?	No	Yes	No	No	No	No	No
$PM_{2.5}$ impact level to meet NAAQS	15.4	23.1	16.6	9.5	8.9	19.4	14.8
Distance from key emission units to NAAQS compliance	80	0	50	40	80	60	60

Table 30. Summary of modeled annual $PM_{2.5}$ concentrations , background levels, and distance from key rock crusher emission units to point of NAAQS compliance

RC- Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ Maximum impact annual concentration (ug/m3) – point of maximum impact	6.9	5.1	6.9	6.9	6.6	4.8	8.0
$PM_{2.5}$ background design value (ug/m3)	6.6	4.5	5.7	5.7	6.6	5.3	6.3
$PM_{2.5}$ (sum of project and background) (ug/m3)	13.5	9.5	12.5	12.6	13.2	10.1	14.3

RC- Daily $PM_{2.5}$	American Rock	Chelan Sand and Gravel	Hiawatha	Huthison Pit	Okanogan Valley Concrete	Ritzville Pit	Smith-Dallesport
$PM_{2.5}$ NAAQS	9.0	9.0	9.0	9.0	9.0	9.0	9.0
NAAQS met at point of maximum impact?	No	No	No	No	No	No	No
$PM_{2.5}$ impact level to meet NAAQS	2.4	4.5	3.3	3.3	2.4	3.8	2.7
Distance from key emission units to NAAQS compliance	60	20	40	40	40	20	50

Table 31. Summary of modeled crystalline silica concentrations and distance from key rock crusher emission units to point of ASIL compliance

RC- Air Toxics	Avg Time	ASIL (mg/m^3)	American Rock (mg/m^3)	Chelan Sand and Gravel (mg/m^3)	Hiawatha (mg/m^3)	Huthison Pit (mg/m^3)	Okanogan Valley Concrete (mg/m^3)	Ritzville Pit (mg/m^3)	Smith-Dallesport (mg/m^3)
Crystalline Silica	24-hr	3.0E+00	2.7E+01	1.5E+01	2.7E+01	3.0E+01	2.4E+01	1.9E+01	3.5E+01
Distance from key emission units to Crystalline Silica ASIL compliance	-	-	200	110	200	130	130	260	190

16. Crystalline Silica – discussion regarding ASIL exceedances

Dispersion modeling showed crystalline silica levels above the ASIL for all source groups. Distances to the ASIL may be challenging for some processes within pits to comply. The ASIL, however, is a screening level intended to be very conservative. The ASIL value (3 mg/m^3) is based on California OEHHA's chronic reference exposure level (REL). This level is considered protective of adverse health effects after long-term exposure. Chronic RELs are designed to address continuous exposures for up to a lifetime, and therefore the annual average concentration is metric that represents continuous exposure. In other words, an annual average exposure to a concentration less than 3 mg/m^3 is not expected to cause adverse effects.

Ecology modeled the annual average concentration of crystalline silica and compared the results to the chronic REL. In all cases, the average concentration at all locations within the modeling domain (including those very near emission units) were less than chronic REL (3 ug/m^3). Therefore, crystalline silica impacts are not likely to pose unacceptable noncancer hazards to offsite receptors.

Table 32. Annual average crystalline silica concentration at each location's point of maximum impact within the modeling domain

Source Group	American Rock (mg/m^3)	Chelan Sand and Gravel (mg/m^3)	Hiawatha (mg/m^3)	Huthison Pit (mg/m^3)	Okanogan Valley Concrete (mg/m^3)	Ritzville Pit (mg/m^3)	Smith-Dallesport (mg/m^3)
HMA	0.6	0.6	0.4	0.5	0.6	1.0	0.6
CB – Central Mix	0.7	0.7	0.5	0.8	0.7	0.8	0.5
CB – Truck Mix	0.4	0.3	0.2	0.3	0.6	0.7	0.2
RC	2.5	1.0	2.5	2.8	1.7	1.6	2.9