

**Statement of Basis
Hot Mix Asphalt Plant General Permit**

**Permit to Construct No. P-2014.0004
Project ID 62427**

**Knife River Corporation - Mountain West - 00533
Boise, Idaho**

Facility ID 777-00533

Final

**July 30, 2020
Chris Duerschner
Permit Writer**

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The purpose of this Statement of Basis is to satisfy the requirements of IDAPA 58.01.01. et seq, Rules for the Control of Air Pollution in Idaho, for issuing air permits.

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ACRONYMS, UNITS, AND CHEMICAL NOMENCLATURE

AAC	acceptable ambient concentrations
AACC	acceptable ambient concentrations for carcinogens
CFR	Code of Federal Regulations
CI	compression ignition
CO	carbon monoxide
DEQ	Department of Environmental Quality
dscf	dry standard cubic feet
EL	screening emission levels
EPA	U.S. Environmental Protection Agency
HAP	hazardous air pollutants
HMA	hot mix asphalt
hp	horsepower
hr/yr	hours per consecutive 12 calendar month period
ICE	internal combustion engines
IDAPA	a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
lb/hr	pounds per hour
MACT	Maximum Achievable Control Technology
MMBtu	million British thermal units
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO _x	nitrogen oxides
NSPS	New Source Performance Standards
PAH	polyaromatic hydrocarbons
PC	permit condition
PM	particulate matter
PM _{2.5}	particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
PM ₁₀	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
POM	polycyclic organic matter
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTC	permit to construct
PTE	potential to emit
PW	process weight rate
RAP	recycled asphalt pavement
RFO	reprocessed fuel oil
<i>Rules</i>	<i>Rules for the Control of Air Pollution in Idaho</i>
SM	synthetic minor
SM80	synthetic minor facility with emissions greater than or equal to 80% of a major source threshold
SO ₂	sulfur dioxide
T/day	tons per calendar day
T/hr	tons per hour
T/yr	tons per consecutive 12 calendar month period
TAP	toxic air pollutants
ULSD	ultra-low sulfur diesel
VOC	volatile organic compounds

FACILITY INFORMATION

Description

Knife River Corporation – Mountain West – 00533 operates an existing hot mix asphalt plant.

The asphalt plant consists of a counter-flow asphalt drum mixer equipped with a with a bag house to control particulate matter, an asphaltic oil storage tank with a heater, and materials transfer equipment. Materials transfer equipment at the facility will include front end loaders, feed bins, storage silos, conveyors, stock piles, and haul trucks.

Asphalt is made at the portable facility as follows. First, stockpiled aggregate is transferred to feed bins. Recycled asphalt pavement (RAP) may be used in the aggregate (up to 50% can be allowed). Aggregate is then dispensed from the feed bins onto feeder conveyors, which transfer the aggregate to the asphalt drum mixer. The Applicant has requested that the asphalt drum mixer be fired on natural gas and LPG, RFO/waste oil. Next, aggregate travels through the rotating drum mixer, and when dried and heated, it is mixed with hot liquid asphaltic oil. The asphaltic oil is heated by the asphalt tank heater to allow it to flow and be mixed with the hot, dry aggregate. The resulting asphalt is conveyed to hot storage bins until it can be loaded into trucks for transport off-site or transferred to silos for temporary storage prior to transport off-site.

The Applicant has proposed that line power and portable electrical generators will be used at the facility. Therefore, IC engines powering electrical generators were included in the application.

Permitting History

The following information was derived from a review of the permit files available to DEQ. Permit status is noted as active and in effect (A) or superseded (S).

July 24, 2014	P-2014.0004, Initial Permit, Permit status (S)
April 6, 2018	P-2014.0004, Name Change, Permit status (S)
October 17, 2019	P-2014.0004, Modification to allow combustion of RFO in the asphalt drum drier, Permit status (A, but will become S upon issuance of this permit)

Application Scope

The purpose of this PTC modification is to allow an alternate operating scenario which the facility may employ when space constraints require a stricter setback distance than otherwise allowed in this permit. The facility proposes to operate two Tier 4 Caterpillar diesel-engine generators.

Application Chronology

April 9, 2020	DEQ received an application and an application fee.
April 15 – April 30, 2020	DEQ provided an opportunity to request a public comment period on the application and proposed permitting action.
May 15, 2020	DEQ determined that the application was complete.
June 24, 2020	DEQ made available the draft permit and statement of basis for peer and regional office review.
July 9, 2020	DEQ made available the draft permit and statement of basis for applicant review.
July 27, 2020	DEQ received the permit processing fee.
July 30, 2020	DEQ issued the final permit and statement of basis.

TECHNICAL ANALYSIS

The asphalt production facility utilizes a baghouse for control of particulate matter emissions from the asphalt drum mixer. In addition, the Applicant will maintain the moisture content in ¼” or smaller aggregate material at 1.5% by weight, using water sprays, using shrouds, or will use other emissions controls to minimize PM₁₀ emissions from aggregate handling.

Emissions Units and Control Equipment

Table 1 EMISSIONS UNIT AND CONTROL EQUIPMENT INFORMATION

Source ID No.	Sources	Control Equipment
Materials Handling	<u>Material Transfer Points:</u> Materials handling Asphalt aggregate transfers Truck unloading of aggregate Aggregate conveyor transfers Aggregate handling	Maintaining the moisture content in ¼” or smaller aggregate material at 1.5% by weight, using water sprays, using shrouds, or other emissions controls
Hot Mix Asphalt Drum Mixer	<u>Asphalt Drum Mixer:</u> Manufacturer: Gencor Model: 400 ultradrum Type: Counter-flow Manufacture Date: 2014 Max. production: 400 T/hr, 5,000 T/day, and 325,000 T/yr Fuel(s): Natural gas, LPG/propane, RFO/Waste Oil	<u>Asphalt Drum Mixer Baghouse:</u> Manufacturer: Gencor/CMI Model: APM 810 Flow rate: 32,258 dscf
Asphaltic Oil Tank Heater	<u>Asphaltic Oil Tank Heater:</u> Heat input rating: 0.6 MMBtu/hr Fuel: Natural gas, LPG/propane	N/A
Primary IC Engine	<u>Primary IC Engine:</u> Manufacturer: CAT Model: C32 Manufacture Date: 2013 Max. power rating: 1,340 bhp Fuel: ULSD diesel Sulfur content: 0.0015% by weight Daily operational limit: 13 hrs/day Annual operational limit: 1,161 hrs/yr	N/A
Secondary IC Engine	<u>Secondary IC Engine:</u> Manufacturer: IVECO Model: N67 Manufacture Date: 2013 Max. power rating: ~268 bhp Fuel: ULSD diesel Sulfur content: 0.0015% by weight Daily operational limit: 13 hrs/day Annual use limit: 2,322 hrs/yr	N/A
Alternate Use IC Engines	<u>Alternate Use IC Engines (2 Engines)</u> Manufacturer: CAT Model: C18 Manufacture Date: 2020 Max. power rating: ~672 bhp Fuel: Distillate Fuel Oil Sulfur content: 0.5% by weight Daily operational limit: 13 hrs/day Annual use limit: 1,161 hrs/yr Tier Certification: Tier 4	N/A

Emissions Inventories

Potential to Emit

IDAPA 58.01.01 defines Potential to Emit as the maximum capacity of a facility or stationary source to emit an air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the facility or source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is state or federally enforceable. Secondary emissions do not count in determining the potential to emit of a facility or stationary source.

Using this definition of Potential to Emit an emission inventory was developed for the asphalt production operations at the facility associated with this proposed project using the DEQ developed HMA EI spreadsheet (see Appendix A). Emissions estimates of criteria pollutant PTE were based on the following assumptions:

- Maximum asphalt throughput does not exceed 400 ton HMA/hour, 5,000 ton HMA/day, and 325,000 ton HMA/year (per the Applicant).
- Emissions from the asphalt drum dryer were based on the maximum emissions from using any of the proposed fuels for combustion in the drum dryer.
- Emissions from a portable rock crusher were included in the emissions modeling analysis with the assumption that when the collocated rock crusher is operating, the asphalt plant is operating at half its maximum capacity.
- Any emissions unit outside a 1,000 ft radius from the asphalt plant was not included in the emissions modeling analysis for this project.
- The Tier 4 IC engines powering a generator each have a maximum brake-horsepower rating of 672 bhp, and proposed operation of up to 13 hour/day and 1,161 hour/year (per the Applicant).

Uncontrolled Potential to Emit

Using the definition of Potential to Emit, uncontrolled Potential to Emit is then defined as the maximum capacity of a facility or stationary source to emit an air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the facility or source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall **not** be treated as part of its design **since** the limitation or the effect it would have on emissions **is not** state or federally enforceable.

The uncontrolled Potential to Emit is used to determine if a facility is a “Synthetic Minor” source of emissions. Synthetic Minor sources are facilities that have an uncontrolled Potential to Emit for regulated air pollutants or HAP above the applicable Major Source threshold without permit limits.

The following table presents the post project uncontrolled emissions for regulated air pollutants as submitted by the Applicant and verified by DEQ staff. Uncontrolled emissions were determined as follows:

- For the asphalt drum mixer uncontrolled emissions were assumed to be based upon four times the proposed annual throughput ($4 \times 325,000 \text{ T/yr} = 1,300,000 \text{ T/yr}$).
- For the asphaltic oil tank heater controlled emissions were scaled up from 4,000 hours per year of permitted operation (as proposed by the Applicant) to 8,760 hours per year for full-time operation.
- For the materials handling operation controlled and uncontrolled emissions were assumed to be equal.
- For both Tier 4 IC engines, controlled emissions were scaled up from 1,161 hours per year of permitted operation (as proposed by the Applicant) to 8,760 hours per year for full-time operation.

The following table presents the uncontrolled Potential to Emit for criteria pollutants as calculated per the DEQ HMA EI spreadsheet. See Appendix A for a detailed presentation of the calculations of these emissions for each emissions unit.

Table 2 UNCONTROLLED POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Emissions Unit	PM ₁₀ /PM _{2.5}	SO ₂	NO _x	CO	VOC
	T/yr	T/yr	T/yr	T/yr	T/yr
Asphalt drum mixer	1.49E+01	1.16E+01	3.57E+01	8.45E+01	2.08E+01
Asphaltic oil tank heater	1.96E-02	1.55E-03	2.58E-01	2.16E-01	1.42E-03
Tier 4 IC Engines (2)	2.11E-01	6.24E-02	4.91E+00	0.00E+00	2.70E-01
Load-out and silo filling	7.20E-01	0.00E+00	0.00E+00	1.64E+00	2.62E+00
Total, Point Sources	15.90	11.63	40.91	86.36	23.70

The following table presents the uncontrolled Potential to Emit for HAP pollutants as calculated per the DEQ HMA EI spreadsheet. See Appendix A for a detailed presentation of the calculations emissions for each emissions unit. Worst-case HAPs emissions were based upon the same assumptions as for criteria pollutants.

Table 3 UNCONTROLLED POTENTIAL TO EMIT FOR HAZARDOUS AIR POLLUTANTS

IDAPA Listing	Hazardous Air Pollutants	Uncontrolled PTE (T/yr)
585	Dioxins	1.08E-07
	Furans	1.99E-07
	Acrolein	1.72E-02
	Antimony	1.17E-04
	Barium	3.78E-03
	Chromium	3.58E-03
	Cobalt	1.71E-05
	Copper	2.02E-03
	Ethyl benzene	1.56E-01
	Hexane	6.03E-01
	Manganese	5.01E-03
	Methyl chloroform	3.12E-02
	Methyl ethyl ketone (MEK)	1.30E-02
	Molybdenum	2.83E-06
	Naphthalene	4.28E-01
	Pentane	1.37E-01
	Phosphorus	1.82E-02
	Propionaldehyde	8.45E-02
	Quinone	1.04E-01
	Selenium	2.28E-04
	Silver	3.12E-04
	Thallium	2.67E-06
	Toluene	1.90E+00
Vanadium	5.93E-06	
Xylene	1.38E-01	
Zinc	3.97E-02	
586	Acetaldehyde	8.46E-01
	Arsenic	3.65E-04
	Benzene	2.85E-01
	Benzo(a)anthracene	1.62E-04
	Benzo(a)pyrene	1.70E-05
	Benzo(b)fluoranthene	1.11E-04
	Benzo(k)fluoranthene	3.56E-05
	Beryllium	3.09E-08
	1,3-Butadiene	0.00E+00
	Cadmium	2.69E-04
	Chrysene	1.80E-04
	Dibenzo(a,h)anthracene	1.43E-05
	Formaldehyde	2.02E+00
	Hexavalent Chromium	2.93E-04
	Indeno(1,2,3-cd)pyrene	2.16E-05
	3-Methylchloranthrene	6.64E-09
Nickel	4.10E-02	
Not listed	Acenaphthene	1.10E-03
	Acenaphthylene	1.47E-02
	Anthracene	2.07E-03
	Benzo(e)pyrene	7.15E-05
	Benzo(g,h,i)perylene	4.89E-05
	Dichlorobenzene	3.09E-06
	Fluoranthene	5.63E-04
	Fluorene	7.68E-03
	Isooctane	2.60E-02
	Mercury	1.69E-03
	2-Methylnaphthalene	1.11E-01
	Perylene	5.72E-06
Phenanthrene	1.66E-02	
Pyrene	2.10E-03	
Total		7.06

Pre-Project Potential to Emit

Pre-project Potential to Emit is used to establish the change in emissions at a facility as a result of this project.

The following table presents the pre-project potential to emit for all criteria pollutants from all emissions units at the facility as submitted by the Applicant and verified by DEQ staff. See Appendix A for a detailed presentation of the calculations of these emissions for each emissions unit.

Table 4 PRE-PROJECT POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Emissions Unit	PM ₁₀ /PM _{2.5}		SO ₂		NO _x		CO		VOC	
	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)
Asphalt drum mixer	9.21E+00	3.74E+00	7.12E+00	2.89E+00	2.20E+01	8.94E+00	5.20E+01	2.11E+01	1.28E+01	5.20E+00
Asphaltic oil tank heater	4.47E-03	8.94E-03	3.53E-04	7.06E-04	5.88E-02	1.71E-01	4.94E-02	9.88E-02	3.24E-03	6.47E-03
Primary IC engine and Secondary IC engine	5.29E-01	3.58E-01	1.58E-02	8.25E-03	1.59E+01	1.02E+01	9.25E+00	6.27E+00	3.49E+00	2.36E+00
Load-out and silo filling	2.09E-01	8.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.40E-01	2.19E-01	1.56E+00	6.35E-01
Pre-Project Totals	9.95	4.19	7.14	2.90	37.96	8.94	61.84	27.69	17.85	8.20

- a) Controlled average emission rate in pounds per hour is a daily average, based on the proposed daily operating schedule and daily limits.
- b) Controlled average emission rate in tons per year is an annual average, based on the proposed annual operating schedule and annual limits.

Post Project Potential to Emit

The following table presents the post project Potential to Emit for criteria pollutants from all emissions units at the facility as determined by DEQ staff. See Appendix A for a detailed presentation of the calculations of these emissions for each emissions unit.

Table 5 POST PROJECT POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Emissions Unit	PM ₁₀ /PM _{2.5}		SO ₂		NO _x		CO		VOC	
	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)	lb/hr ^(a)	T/yr ^(b)
Asphalt drum mixer	9.21E+00	3.74E+00	7.12E+00	2.89E+00	2.20E+01	8.94E+00	5.20E+01	2.11E+01	1.28E+01	5.20E+00
Asphaltic oil tank heater	4.47E-03	8.94E-03	3.53E-04	7.06E-04	5.88E-02	1.71E-01	4.94E-02	9.88E-02	3.24E-03	6.47E-03
Primary IC engine and Secondary IC engine	5.29E-01	3.58E-01	1.58E-02	8.25E-03	1.59E+01	1.02E+01	9.25E+00	6.27E+00	3.49E+00	2.36E+00
Load-out and silo filling	2.09E-01	8.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.40E-01	2.19E-01	1.56E+00	6.35E-01
Post Project Totals	9.95	4.19	7.14	2.90	37.96	19.31	61.84	27.69	17.85	8.20
Alternate Operating Scenario										
Asphalt drum mixer	8.05E+00	3.74E+00	6.23E+00	2.89E+00	1.93E+01	8.94E+00	4.55E+01	2.11E+01	1.12E+01	5.20E+00
Asphaltic oil tank heater	4.47E-03	8.94E-03	3.53E-04	7.06E-04	5.88E-02	1.71E-01	4.94E-02	9.88E-02	3.24E-03	6.47E-03
Primary IC engine and Secondary IC engine	4.81E-02	2.79E-02	4.75E+00	2.67E+00	1.12E+00	6.50E-01	0.00E+00	0.00E+00	6.17E-02	3.58E-02
Load-out and silo filling	3.88E-01	8.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.85E-01	2.19E-01	1.41E+00	6.35E-01
Post Project Totals	8.49	3.77	10.98	5.65	20.43	9.71	46.43	21.22	12.68	5.24

- a) Controlled average emission rate in pounds per hour is a daily average, based on the proposed daily operating schedule and daily limits.
- b) Controlled average emission rate in tons per year is an annual average, based on the proposed annual operating schedule and annual limits.

As demonstrated in Tables 2 and 4, this facility has uncontrolled potential to emit for PM₁₀, SO₂, NO_x, CO, and VOC emissions less than the Major Source threshold of 100 T/yr and a controlled potential to emit for PM₁₀, SO₂, NO_x, CO, and VOC emissions less than the Major Source threshold of 100 T/yr. In addition, as demonstrated in Table 3, this facility has an uncontrolled potential to emit for HAP emissions less than the Major Source threshold of 10 T/yr for any one HAP and 25 T/y for all HAPs combined. Therefore, this facility is designated as a Minor facility.

Change in Potential to Emit

The change in facility-wide potential to emit is used to determine if a public comment period may be required and to determine the processing fee per IDAPA 58.01.01.225. The following table presents the facility-wide change in the potential to emit for criteria pollutants.

Table 6 CHANGES IN POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Emissions	PM ₁₀ /PM _{2.5}		SO ₂		NO _x		CO		VOC	
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Pre-Project Potential to Emit	9.95	4.19	7.14	2.90	37.96	19.31	61.84	27.69	17.85	8.20
Post Project Potential to Emit	8.48	3.48	6.24	2.90	20.43	11.30	46.43	21.22	12.67	5.33
Changes in Potential to Emit	-1.47	-0.71	-0.90	0.00	-17.53	-8.01	-15.41	-6.47	-5.18	-2.87

Non-Carcinogenic TAP Emissions

A summary of the estimated PTE emissions increase of non-carcinogenic toxic air pollutants (TAPs) is provided in the following table.

Table 7 PRE- AND POST PROJECT POTENTIAL TO EMIT FOR NON-CARCINOGENIC TOXIC AIR POLLUTANTS

Non-Carcinogenic Toxic Air Pollutants	Pre-Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Post Project 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Change in 24-hour Average Emissions Rates for Units at the Facility (lb/hr)	Non-Carcinogenic Screening Emission Level (lb/hr)	Exceeds Screening Level? (Y/N)
Acetone	1.75E-01	1.40E-01	-0.0350	119	No
Acrolein	5.55E-03	4.37E-03	-0.0012	0.017	No
Antimony	3.75E-05	3.00E-05	0.0000	0.033	No
Barium	1.21E-03	9.69E-04	-0.0002	2	No
Carbon disulfide	1.13E-04	4.15E-04	-0.0002	0.033	No
Chromium metal (II and III)	1.15E-03	9.17E-04	-0.0002	0.033	No
Cobalt metal dust, and fume	5.47E-06	4.38E-06	0.0000	0.0033	No
Copper (fume)	6.46E-04	5.17E-04	-0.0001	0.013	No
Crotonaldehyde	1.79E-02	1.43E-02	-0.0036	0.38	No
Cumene	9.53E-04	7.62E-04	-0.0002	16.3	No
Ethyl benzene	5.24E-02	4.27E-02	-0.0097	29	No
Ethyl chloride (Chloroethane)	1.82E-06	8.27E-05	0.0001	176	No
Heptane	1.96E+00	1.57E+00	-0.3900	109	No
Hexane	1.94E-01	1.57E-01	-0.0370	12	No
Manganese as Mn (fume)	1.60E-03	1.28E-03	-0.0003	0.067	No
Mercury (alkyl compounds as Hg)	5.42E-04	4.33E-04	-0.0001	0.001	No
Methyl bromide	8.32E-05	1.66E-04	0.0001	1.27	No
Methyl chloride (Chloromethane)	1.30E-04	5.71E-04	0.0004	6.867	No
Methyl chloroform	1.00E-02	8.00E-03	-0.0020	127	No
Methyl ethyl ketone (MEK)	4.59E-03	4.47E-03	-0.0001	39.3	No
Molybdenum (soluble)	6.47E-07	6.47E-07	0.0000	0.333	No
Pentane	1.53E-03	1.53E-03	0.0000	118	No
Phenol	8.38E-04	6.71E-04	-0.0002	1.27	No
Phosphorous	5.83E-03	4.67E-03	-0.0012	0.007	No
Propionaldehyde	2.71E-02	2.17E-02	-0.0054	0.0287	No
Quinone	3.33E-02	2.67E-02	-0.0066	0.027	No
Selenium	7.29E-05	5.83E-05	0.0000	0.013	No
Silver as Ag (soluble)	1.00E-04	8.00E-05	0.0000	0.001	No
Styrene monomer	6.33E-05	1.60E-04	0.0001	6.67	No
Thallium	8.54E-07	6.83E-07	0.0000	0.007	No
Toluene	6.08E-01	4.87E-01	-0.1210	25	No
Trichloroethylene	0.00E+00	0.00E+00	0.0000	17.93	No
Vanadium as V ₂ O ₅ , (respirable dust and fume)	1.35E-06	1.35E-06	0.0000	0.003	No
Xylene	5.34E-02	4.79E-02	-0.0055	29	No
Zinc metal	1.27E-02	1.02E-02	-0.0025	0.667	No

None of the PTEs for non-carcinogenic TAPs were exceeded as a result of this project. Therefore, modeling is not required for any non-carcinogenic TAP because none of the 24-hour average carcinogenic screening ELs identified in IDAPA 58.01.01.586 were exceeded.

Carcinogenic TAP Emissions

A summary of the estimated PTE for emissions increase of carcinogenic TAPs is provided in the following table.

Table 8 PRE- AND POST PROJECT POTENTIAL TO EMIT FOR CARCINOGENIC TOXIC AIR POLLUTANTS

Carcinogenic Toxic Air Pollutants	Pre-Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Post Project Annual Average Emissions Rates for Units at the Facility (lb/hr)	Change in Annual Average Emissions Rates for Units at the Facility (lb/hr)	Carcinogenic Screening Emission Level (lb/hr)	Exceeds Screening Level? (Y/N)
Acetaldehyde	4.86E-02	4.83E-02	-0.0003	3.0E-03	No
Arsenic	2.08E-05	2.08E-05	0.000000	1.5E-06	No
Benzene	1.60E-02	1.57E-02	-0.0003	8.0E-04	No
Beryllium and compounds	3.22E-05	3.22E-09	-0.0000322	2.8E-05	No
Cadmium and compounds	1.55E-05	1.55E-05	0.000000	3.7E-06	No
Chromium (VI)	1.67E-05	1.67E-05	0.000000	5.6E-07	No
Dichloromethane	0.00E+00	5.48E-06	0.000005	1.6E-03	No
Formaldehyde	1.16E-01	1.18E-01	0.0020	5.1E-04	Yes
Nickel	2.34E-03	2.34E-03	0.0000	2.7E-05	No
PAHs Total	3.39E-02	3.49E-02	0.0010	9.1E-05	Yes
POM ^(a) Total	4.47E-05	6.81E-05	0.000023	2.0E-06	Yes
Tetrachloroethylene	6.67E-05	5.34E-05	0.0000	1.3E-02	No

a) Polycyclic Organic Matter (POM) is considered as one TAP comprised of: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, chrysene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene. The total is compared to benzo(a)pyrene.

The emissions increments for some carcinogenic TAPs exceeded their respective screening levels as a result of this project. Therefore, modeling is required for formaldehyde, Total PAHs, and Total POM because the annual average carcinogenic screening ELs identified in IDAPA 58.01.01.586 were exceeded.

Post Project HAP Emissions

The following table presents the post project potential to emit for hazardous air pollutants (HAPs) pollutants from all emissions units at the facility as submitted by the Applicant and verified by DEQ staff. See Appendix A for a detailed presentation of the calculations of these emissions for each emissions unit.

Table 9 POTENTIAL TO EMIT FOR HAZARDOUS AIR POLLUTANTS EMISSIONS

IDAPA Listing	Hazardous Air Pollutants	PTE (T/yr)
585	Dioxins	2.70E-08
	Furans	4.98E-08
	Acrolein	4.27E-03
	Antimony	2.93E-05
	Barium	9.48E-04
	Chromium	8.95E-04
	Cobalt	4.32E-06
	Copper	5.05E-04
	Ethyl benzene	3.90E-02
	Hexane	1.52E-01
	Manganese	1.25E-03
	Methyl chloroform	7.80E-03
	Methyl ethyl ketone (MEK)	3.25E-03
	Molybdenum	1.29E-06
	Naphthalene	1.06E-01
	Pentane	3.06E-03
	Phosphorus	4.55E-03
	Propionaldehyde	2.11E-02
	Quinone	2.60E-02
	Selenium	5.69E-05
	Silver	7.80E-05
Thallium	6.66E-07	
Toluene	4.73E-01	
Vanadium	2.71E-06	
Xylene	3.36E-02	
Zinc	9.91E-03	
586	Acetaldehyde	2.11E-01
	Arsenic	9.12E-05
	Benzene	6.67E-02
	Benzo(a)anthracene	3.75E-05
	Benzo(a)pyrene	3.00E-06
	Benzo(b)fluoranthene	2.23E-05
	Benzo(k)fluoranthene	7.86E-06
	Beryllium	1.41E-08
	1,3-Butadiene	0.00E+00
	Cadmium	6.79E-05
	Chrysene	3.76E-05
	Dibenzo(a,h)anthracene	1.89E-06
	Formaldehyde	5.04E-01
	Hexavalent Chromium	7.31E-050
Indeno(1,2,3-cd)pyrene	3.40E-06	
3-Methylchloranthrene	2.12E-09	
Nickel	1.02E-02	
Not listed	Acenaphthene	2.53E-04
	Acenaphthylene	3.63E-03
	Anthracene	5.10E-04
	Benzo(e)pyrene	1.79E-05
	Benzo(g,h,l)perylene	9.54E-06
	Dichlorobenzene	1.14E-06
	Fluoranthene	1.21E-04
	Fluorene	1.86E-03
	Isooctane	6.50E-03
	Mercury	4.23E-04
	2-Methylnaphthalene	2.76E-02
	Perylene	1.43E-06
	Phenanthrene	3.96E-03
Pyrene	5.08E-04	

Total	1.72
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The estimated PTE for all federally listed HAPs combined is below 25 T/yr and no PTE for a federally listed HAP exceeds 10 T/yr. Therefore, this facility is not a Major Source for HAPs.

Ambient Air Quality Impact Analyses

As presented in the Modeling Memo in Appendix B, the estimated emission rates of PM₁₀, PM_{2.5}, SO₂, NO_x, CO, VOC, and TAP from this project exceeded applicable screening emission levels (EL) and published DEQ modeling thresholds established in IDAPA 58.01.01.585-586 and in the State of Idaho Air Quality Modeling Guideline¹. Refer to the Emissions Inventories section for additional information concerning the emission inventories.

The applicant has demonstrated pre-construction compliance to DEQ's satisfaction that emissions from this facility will not cause or significantly contribute to a violation of any ambient air quality standard. The applicant has also demonstrated pre-construction compliance to DEQ's satisfaction that the emissions increase due to this permitting action will not exceed any acceptable ambient concentration (AAC) or acceptable ambient concentration for carcinogens (AACC) for toxic air pollutants (TAP). A summary of the Ambient Air Impact Analysis for TAP is provided in Appendix B.

An ambient air quality impact analysis document has been crafted by DEQ based on a review of the modeling analysis submitted in the application. That document is part of the final permit package for this permitting action (see Appendix B).

As a result of the ambient air quality impact analysis, as well as information submitted by the Applicant for specific operating scenarios, the following conditions (along with corresponding monitoring and record keeping requirements) were placed in the permit:

- The Emissions Limits permit condition,
- The Alternate Asphalt Production Limits permit condition,
- The Reduced Asphalt Production Limits permit condition,
- The Alternate Asphalt Operation Setback Distance Requirements permit condition

REGULATORY ANALYSIS

Attainment Designation (40 CFR 81.313)

This modeling analysis for this facility demonstrates compliance with applicable standards in attainment areas. However, because a separate modeling analysis was not provided to demonstrate compliance with applicable standards in non-attainment areas, this portable facility is not permitted for operation in non-attainment areas. This requirement is assured by Permit Condition 2.6.

Facility Classification

The AIRS/AFS facility classification codes are as follows:

For HAPs (Hazardous Air Pollutants) Only:

A = Use when any one HAP has permitted emissions > 10 T/yr or if the aggregate of all HAPS (Total HAPs) has permitted emissions > 25 T/yr.

SM80 = Use if a synthetic minor (uncontrolled HAPs emissions are > 10 T/yr or if the aggregate of all

¹ Criteria pollutant thresholds in Table 1, State of Idaho Air Quality Modeling Guideline, Doc ID AQ-011, rev. 1, December 31, 2002.

uncontrolled HAPs (Total HAPs) emissions are > 25 T/yr and permitted emissions fall below applicable major source thresholds) and the permit sets limits > 8 T/yr of a single HAP or ≥ 20 T/yr of Total HAPs.

- SM = Use if a synthetic minor (uncontrolled HAPs emissions are > 10 T/yr or if the aggregate of all uncontrolled HAPs (Total HAPs) emissions are > 25 T/yr and permitted emissions fall below applicable major source thresholds) and the permit sets limits < 8 T/yr of a single HAP and/or < 20 T/yr of Total HAPs.
- B = Use when the potential to emit (i.e. uncontrolled emissions and permitted emissions) are below the 10 and 25 T/yr HAP major source thresholds.
- UNK = Class is unknown.

For All Other Pollutants:

- A = Use when permitted emissions of a pollutant are > 100 T/yr.
- SM80 = Use if a synthetic minor for the applicable pollutant (uncontrolled emissions are > 100 T/yr and permitted emissions fall below 100 T/yr) and permitted emissions of the pollutant are ≥ 80 T/yr.
- SM = Use if a synthetic minor for the applicable pollutant (uncontrolled emissions are > 100 T/yr and permitted emissions fall below 100 T/yr) and permitted emissions of the pollutant are < 80 T/yr.
- B = Use when the potential to emit (i.e. uncontrolled emissions and permitted emissions) are below the 100 T/yr major source threshold.
- UNK = Class is unknown.

Table 10 Regulated Air Pollutant Facility Classification

Pollutant	Uncontrolled PTE (T/yr)	Permitted PTE (T/yr)	Major Source Thresholds (T/yr)	AIRS/AFS Classification
PM	22.40	5.40	100	B
PM ₁₀	15.90	3.77	100	B
PM _{2.5}	15.45	3.66	100	B
SO ₂	32.38	5.65	100	B
NO _x	40.91	9.71	100	B
CO	86.36	21.22	100	B
VOC	23.70	5.24	100	B
HAP (single)	2.02	0.504	10	B
Total HAPs	7.06	1.72	25	B

Permit to Construct (IDAPA 58.01.01.201)

IDAPA 58.01.01.201.....Permit to Construct Required

The permittee has requested that a PTC be issued to the facility for the modified emissions source. Therefore, a permit to construct is required to be issued in accordance with IDAPA 58.01.01.220. This permitting action was processed in accordance with the procedures of IDAPA 58.01.01.200-228.

Tier II Operating Permit (IDAPA 58.01.01.401)

IDAPA 58.01.01.401.....Tier II Operating Permit

The application was submitted for a permit to construct (refer to the Permit to Construct section), and an optional Tier II operating permit has not been requested. Therefore, the procedures of IDAPA 58.01.01.400–410 were not applicable to this permitting action.

Visible Emissions (IDAPA 58.01.01.625)

IDAPA 58.01.01.625.....Visible Emissions

The sources of PM₁₀ emissions at this facility are subject to the State of Idaho visible emissions standard of 20% opacity. This requirement is assured by Permit Conditions 3.5, 4.4, and 5.4.

Fugitive Emissions (IDAPA 58.01.01.650)

IDAPA 58.01.01.650.....Rules for the Control of Fugitive Emissions

The sources of fugitive emissions at this facility are subject to the State of Idaho fugitive emissions standards. These requirements are assured by Permit Conditions 2.1, 2.2, and 2.8.

Particulate Matter – New Equipment Process Weight Limitations (IDAPA 58.01.01.701)

IDAPA 58.01.01.701.....Particulate Matter – New Equipment Process Weight Limitations

IDAPA 58.01.01.700 through 703 set PM emission limits for process equipment based on when the piece of equipment commenced operation and the piece of equipment’s process weight (PW) in pounds per hour (lb/hr). IDAPA 58.01.01.701 and IDAPA 58.01.01.702 establish PM emission limits for equipment that commenced operation on or after October 1, 1979 and for equipment operating prior to October 1, 1979, respectively.

For equipment that commenced operation on or after October 1, 1979, the PM allowable emission rate (E) is based on one of the following four equations:

- IDAPA 58.01.01.701.01.a: If PW is < 9,250 lb/hr; $E = 0.045 (PW)^{0.60}$
- IDAPA 58.01.01.701.01.b: If PW is $\geq 9,250$ lb/hr; $E = 1.10 (PW)^{0.25}$

For equipment that commenced prior to October 1, 1979, the PM allowable emission rate is based on one of the following equations:

- IDAPA 58.01.01.702.01.a: If PW is < 17,000 lb/hr; $E = 0.045 (PW)^{0.60}$
- IDAPA 58.01.01.702.01.b: If PW is $\geq 17,000$ lb/hr; $E = 1.12 (PW)^{0.27}$

For the new asphalt drum mixer emissions unit proposed to be installed as a result of this project with a proposed throughput of 350 T/hr, E is calculated as follows:

- Proposed throughput = 350 T/hr x 2,000 lb/1 T = 700,000 lb/hr

Therefore, E is calculated as:

- $E = 1.10 \times PW^{0.25} = 1.10 \times (700,000)^{0.25} = 31.8 \text{ lb-PM/hr}$

As presented previously in the Emissions Inventories Section of this evaluation the post project PTE for this emissions unit is 8.49 lb-PM₁₀/PM_{2.5} per hour. Assuming PM is 50% PM₁₀/PM_{2.5} means that PM emissions will be 17.0 lb-PM/hr (8.49 lb- PM₁₀/PM_{2.5} per hour ÷ 0.5 lb-PM₁₀/PM_{2.5} per lb-PM). This is less than the calculated Rule requirement PM emissions rate of 31.8 lb-PM/hr. Therefore, compliance with this requirement has been demonstrated.

Rules for Control of Odors (IDAPA 58.01.01.775)

IDAPA 58.01.01.750..... Rules for Control of Odors

Section 776.01 states that no person shall allow, suffer, cause, or permit the emission of odorous gases, liquids, or solids into the atmosphere in such quantities as to cause air pollution. These requirements are assured by Permit Conditions 2.7 and 2.11.

Rules for Control of Hot-Mix Asphalt Plants (IDAPA 58.01.01.805)

IDAPA 58.01.01.805.....Rules for Control of Hot-Mix Asphalt Plants

The purpose of Sections 805 through 808 is to establish for hot-mix asphalt plants restrictions on the emission of particulate matter.

Section 806 states that no person shall cause, allow or permit a hot-mix asphalt plant to have particulate emissions which exceed the limits specified in Sections 700 through 703. As demonstrated previously, these requirements have been met by the proposed PM₁₀ emissions rate (see Section on Particulate Matter – New Equipment Process Weight Limitations).

Section 807 states that in the case of more than one stack to a hot-mix asphalt plant, the emission limitation will be based on the total emission from all stacks. The proposed facility only has one stack for emissions from the asphalt drum dryer so there is no need to combine emissions limits from multiple stacks into one stack as required.

Section 808.01 requires fugitive emission controls as follows: No person shall cause, allow or permit a plant to operate that is not equipped with an efficient fugitive dust control system. The system shall be operated and maintained in such a manner as to satisfactorily control the emission of particulate material from any point other than the stack outlet.

Section 808.02 requires plant property dust controls as follows: The owner or operator of the plant shall maintain fugitive dust control of the plant premises and plant owned, leased or controlled access roads by paving, oil treatment or other suitable measures. Good operating practices, including water spraying or other suitable measures, shall be employed to prevent dust generation and atmospheric entrainment during operations such as stockpiling, screen changing and general maintenance.

These requirements are assured by Permit Conditions 2.1 and 2.2.

Title V Classification (IDAPA 58.01.01.300, 40 CFR Part 70)

IDAPA 58.01.01.301..... Requirement to Obtain Tier I Operating Permit

Post project facility-wide emissions from this facility do not have a potential to emit greater than 100 tons per year for PM₁₀, SO₂, NO_x, CO, and VOC, or 10 tons per year for any one HAP or 25 tons per year for all HAP combined as demonstrated previously in the Emissions Inventories Section of this analysis. Therefore, the facility is not a Tier I source in accordance with IDAPA 58.01.01.006 and the requirements of IDAPA 58.01.01.301 do not apply.

PSD Classification (40 CFR 52.21)

40 CFR 52.21..... Prevention of Significant Deterioration of Air Quality

The facility is not a major stationary source as defined in 40 CFR 52.21(b)(1), nor is it undergoing any physical change at a stationary source not otherwise qualifying under paragraph 40 CFR 52.21(b)(1) as a major stationary source, that would constitute a major stationary source by itself as defined in 40 CFR 52.21(b)(1). Therefore in accordance with 40 CFR 52.21(a)(2), PSD requirements are not applicable to this permitting action. The facility is/is not a designated facility as defined in 40 CFR 52.21(b)(1)(i)(a), and does not have facility-wide emissions of any criteria pollutant that exceed 250 T/yr.

Non-road Engine (40 CFR 1068)

40 CFR 1068..... General Compliance Provisions for Highway, Stationary, and Nonroad Programs

40 CFR 1068.30 defines a non-road engine is an internal combustion engine that is by itself or in or on a piece of equipment, it is portable or transportable, meaning designed to be and capable of being carried or moved from one location to another. Indicia of transportability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform.

An IC engine is not a non-road engine if it will remain at a location for more than 12 consecutive months or a shorter period of time for an engine located at a seasonal source. A location is any single site at a building, structure, facility, or installation. For any engine (or engines) that replaces an engine at a location and that is intended to perform the same or similar function as the engine replaced, include the time period of both engines in calculating the consecutive time period. An engine located at a seasonal source is an engine that remains at a

seasonal source during the full annual operating period of the seasonal source. A seasonal source is a stationary source that remains in a single location on a permanent basis (*i.e.*, at least two years) and that operates at that single location approximately three months (or more) each year. See §1068.31 for provisions that apply if the engine is removed from the location.

For this project the facility has proposed two compression ignition IC engines that meets the definition of a non-road engine. Note: If the IC engine remains at a site for more than 12 months, the facility shall submit an application for a PTC modification to permit the engine as stationary source IC engine. Therefore, NSPS Subpart III and MACT Subpart ZZZZ do not apply to the IC engines involved with this project.

This requirement is assured by Permit Condition 2.5.

NSPS Applicability (40 CFR 60)

Because the facility produces asphalt the following NSPS Subpart is applicable:

- 40 CFR 60, Subpart I - National Standards of Performance for Hot Mix Asphalt Plants

DEQ has been delegated authority to this subpart.

40 CFR 60, Subpart I

National Standards of Performance for Hot Mix Asphalt Plants

This permitting action is for allowing using two Tier 4 engines for the existing asphalt plant. This permitting action does not change the applicability of this subpart to the existing HMA plant. The requirements of this subpart apply to the HMA plant:

§ 60.90.....Applicability and designation of affected facility

In accordance with §60.90(a), each hot mix asphalt facility is an affected facility. In accordance with §60.90(b), any hot mix asphalt facility that commences construction or modification after June 11, 1973 is subject to the requirements of Subpart I.

The affected facility includes: the dryer; systems for screening, handling, storing, and weighing hot aggregate; systems for loading, transferring, and storing mineral filler; systems for mixing hot mix asphalt; and the loading, transfer, and storage systems associated with emission control systems.

§ 60.91.....Definitions

This section contains the definitions of this subpart.

§ 60.92.....Standard for particulate matter

In accordance with §60.92, no owner or operator shall discharge or cause the discharge into the atmosphere from any affected facility any gases which contain particulate matter in excess of 0.04 gr/dscf or exhibit 20% opacity or greater. Permit Condition 3.4 includes the requirements of this section.

§ 60.93.....Test methods and procedures

In accordance with §60.93(a), performance tests shall use as reference methods and procedures the test methods in Appendix A of 40 CFR 60.

In accordance with §60.93(b), compliance with the particulate matter standards shall be determined by EPA Reference Method 5, and opacity shall be determined by EPA Reference Method 9. Per the information submitted by the Applicant (see the application, pg. 4), the initial Subpart I source test has been performed on this asphalt plant. Therefore, no initial Subpart I source test is required of this asphalt plant.

NESHAP Applicability (40 CFR 61)

The facility is not subject to any NESHAP requirements in 40 CFR 61.

MACT Applicability (40 CFR 63)

Because the facility has proposed to install and operate two compression ignition IC engines the following NESHAP Subpart may be applicable:

- 40 CFR 60, Subpart ZZZZ - National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

However, as discussed previously in the Non-road Engine (40 CFR 1068) section, the proposed engines meet the definition of non-road engines. Therefore, the requirements of NESHAP Subpart ZZZZ do not apply to the two IC engines proposed for this project.

Permit Conditions Review

This section describes only those permit conditions that have been added, revised, modified or deleted as a result of this permitting action.

Permit Condition 1.1 establishes the permit to construct scope.

Permit Condition, Table 1.1, provides a description of the purpose of the permit and the regulated sources, the process, and the control devices used at the facility.

Facility-Wide Conditions

Permit Condition 2.5 establishes that the permittee shall relocate the permitted HMA production equipment to a different aggregate pit or storage area at least once every 12 months. This requirement was requested by the applicant because this is how the plant will normally be operated and because it allowed the set-back distances, required through the Ambient Air Quality Analysis, to be less than what would be required if more than one year of operation at a site was requested.

Asphalt Production Equipment

Permit Condition 3.1 provides a process description of the asphalt production process at this facility.

Permit Condition 3.7 establishes alternate asphalt production limits which the facility shall not exceed while operating the Tier 4 engines.

Permit Condition 3.8 establishes a daily asphalt production limit for the asphalt production operation when operated on days when a collocated portable rock crusher is operated. This requirement was based upon the air quality modeling analysis performed for this application.

Permit Condition 3.11 establishes an alternate asphalt operation setback distance which the facility shall not exceed when operating the Tier 4 engines and complying with the alternate asphalt production limits permit condition.

Permit Condition 3.25 establishes that the permittee monitor used oil fuel shipments to demonstrate compliance with the used oil fuel requirements of the permit.

Internal Combustion Engines

Permit Condition 5.1 provides a process description of the IC engines process at this facility.

Permit Condition 5.2 provides a description of the control devices used on the IC engines at this facility.

Permit Condition 5.3 establishes hourly and annual emissions limits for PM₁₀/PM_{2.5}, SO₂, NO_x, CO, and VOC emissions from the IC engines at this facility.

As discussed previously, Permit Condition 5.4 establishes a 20% opacity limit for the Tier 4 IC engine exhaust stacks or functionally equivalent openings associated with the asphalt production operation.

Permit Condition 5.5 establishes that the Tier 4 IC engines shall be EPA Tier certified to the certification proposed by the Applicant.

Permit Condition 5.6 establishes a daily and an annual operation limit for the Tier 4 IC Engines as proposed by the Applicant.

Permit Condition 5.7 establishes fuel use restrictions for combustion in the Tier 4 IC Engines. These fuel use restrictions were based on the fuel proposed by the Applicant to be combusted in the Tier 4 IC Engines.

Permit Condition 5.8 establishes that the permittee monitor and record daily operation of the Tier 4 IC Engines to demonstrate compliance with the Tier 4 IC Engine Operating Limits permit condition.

Permit Condition 5.9 establishes that the permittee monitor distillate fuel oil shipments to demonstrate compliance with the distillate fuel oil requirements of the permit.

Permit Condition 5.10 establishes that the permittee shall maintain records as required by the Recordkeeping General Provision.

PUBLIC REVIEW

Public Comment Opportunity

An opportunity for public comment period on the application was provided in accordance with IDAPA 58.01.01.209.01.c or IDAPA 58.01.01.404.01.c. During this time, there were no comments on the application and there was not a request for a public comment period on DEQ's proposed action. Refer to the chronology for public comment opportunity dates.

APPENDIX A – EMISSIONS INVENTORIES

Facility:
7/28/2020 15:46

Knife River Corporation - Mountain West - 0053
Permit/Facility ID: P-2014.0004 777-00533

Asphalt Tank Heater - #2 Oil Fired, Estimated GHG Emissions Using AP-42 Sections 11.1 (HMA Plants) & 1.3 (Fuel Oil Combustion)

Hot Mix Plant Fuel Type Toggle (#2) = 0
Hot Mix Plant Fuel Type Toggle (Used Oil) = 1
Hot Mix Plant Fuel Type Toggle (NG) = 1
Hot Mix Plant Fuel Type Toggle (LPG) = 1
Tank Heater Fuel Type Toggle (NG) = 0
Tank Heater Fuel Type Toggle (#2) = 1

Note: CO2e emissions from the silo, loadout operation, and the tanks were assumed to be negligible (less than 1 ton per year).

Green House Gas Emissions When Combusting #2 Fuel Oil

Asphalt Plant Emissions	Emission Factor (EF)	EF Units	EF Source	Emissions (T/yr)	Global Warming Potential	CO ₂ e (T/yr)
CO ₂	33.00	lb/T	AP-42 Table 11.1-7	0.00	1.00	0.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	0.00	21.00	0.00
N ₂ O	0.26	lb/10 ³ gal	AP-42 Table 1.3-8	0.000000	310.00	0.00

Tank Heater	Emission Factor (EF)	EF Units	EF Source	T/yr	Global Warming Potential	CO ₂ e T/yr
CO ₂	Assumes all carbon is converted to CO ₂			231.19	1	231.19
Methane	0.216	lb/10 ³ gal	AP-42 Table 1.3-3	1.89E-03	21	0.04
N ₂ O	0.26	lb/10 ³ gal	AP-42 Table 1.3-8	2.11E+00	310	655.41

Green House Gas Emissions When Combusting Used Oil

Asphalt Plant Emissions	Emission Factor (EF)	EF Units	EF Source	Emissions (T/yr)	Global Warming Potential	CO ₂ e (T/yr)
CO ₂	33.00	lb/T	AP-42 Table 11.1-7	5,362.50	1.00	5,362.50
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.95	21.00	40.95
N ₂ O	0.53	lb/10 ³ gal	AP-42 Table 1.3-8	0.269362	310.00	83.50

Green House Gas Emissions When Combusting Natural Gas

Asphalt Plant Emissions	Emission Factor (EF)	EF Units	EF Source	Emissions (T/yr)	Global Warming Potential	CO ₂ e (T/yr)
CO ₂	33.00	lb/T	AP-42 Table 11.1-7	5,362.50	1.00	5,362.50
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.95	21.00	40.95
N ₂ O	0.26	lb/10 ³ gal	AP-42 Table 1.3-8	0.132140	310.00	40.95

Tank Heater	Emission Factor (EF)	EF Units	EF Source	T/yr	Global Warming Potential	CO ₂ e T/yr
CO ₂	0.12	lb/scf	AP-42 Table 1.4-2	0.00	1	0.00
Methane	0.0000023	lb/scf	AP-42 Table 1.4-2	0.00E+00	21	0.00
N ₂ O	0.0000022	lb/scf	AP-42 Table 1.4-2	0.00E+00	310	0.00

Green House Gas Emissions When Combusting LPG

Asphalt Plant Emissions	Emission Factor (EF)	EF Units	EF Source	Emissions (T/yr)	Global Warming Potential	CO ₂ e (T/yr)
CO ₂	33.00	lb/T	AP-42 Table 11.1-7	5,362.50	1.00	5,362.50
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.95	21.00	40.95
N ₂ O	0.26	lb/10 ³ gal	AP-42 Table 1.3-8	0.132140	310.00	40.95

Green House Gas Emissions When Combusting Diesel Fuel

IC Engine 1 < 600 bhp	Emission Factor (EF)	EF Units	EF Source	Emissions (T/yr)	Global Warming Potential	CO ₂ e (T/yr)
CO ₂	1.16	lb/bhp-hr	AP-42 Table 3.4-1	0.00	1.00	0.00

IC Engine 2 > 600 bhp	Emission Factor (EF)	EF Units	EF Source	Emissions (T/yr)	Global Warming Potential	CO ₂ e (T/yr)
CO ₂	1.16	lb/bhp-hr	AP-42 Table 3.4-1	3,414.30	1.00	3,414.30

Total Green House Gas Emissions

Total Emissions	CO ₂ e (T/yr)
CO ₂	9,007.99
Methane	40.99
N ₂ O	738.92
Grand Total	9,787.89

Hot Mix Asphalt EI Spreadsheet

Idaho Department of Environmental Quality, Air Quality Division, Boise, Idaho

Version 8/2/18

Information shown in bold blue on any worksheet indicates user input for that cell. Black or blue text (normal or bold) is calculated or hard-wired -- do not type over formulas in these cells.

These worksheets were developed to expedite processing of PTC permits for Hot Mix Asphalt (HMA) facilities that are collocated with only one rock crushing plant and no other sources of emissions within 1,000 feet.

User Input:

Facility Data Input worksheet: Input facility-specific data including contact information, equipment ratings, proposed HMA production levels, and tank heater and generator hours of operation. Select fuel types and generator options as noted below.

Short term source factor for carcinogens is set to "N", i.e., No. Do not change this to Y. Do not delete cells related to this as this will zero out carcinogenic emissions.

Using T-RACT for carcinogens is set to "N", i.e., No. Do not change this to Y. If appropriate, apply T-RACT factor of 10 to the carcinogenic ambient impact results from the modeling analysis.

Asphalt Drum Mixer/Dryer with Fabric Filter (Baghouse), either counterflow or parallel flow, fired by the following fuels:

For distillate fuel oil the default is 0.5% sulfur content by weight. User input is required in "Facility Data Input" for any other sulfur content.

For used Oil/RFO4 the default is 0.5% sulfur content by weight. User input required in "Facility Data Input" for any other sulfur content.

Natural gas

LPG/propane

Note: For Facility Data Input., input "1" (use this fuel) or "0" (don't use this fuel).

Note: The EI summary sheets will use the highest emission for any selected fuel for each pollutant.

Asphaltic Oil Tank Heater, either fired by #2 fuel oil or natural gas

Note: For Facility Data Input., input "1" (use this fuel) or "0" (don't use this fuel).

Note: If line power is ALWAYS used to power the Asphaltic oil tank heater, input "0" for each fuel.

For distillate fuel oil the default is 0.5% sulfur content by weight. User input is required in "Facility Data Input" for any other sulfur content.

Note: The EI summary sheets will use the highest emission for any selected fuel for each pollutant.

For IC Engines Powering Electrical Generators (with a maximum of one small, less than 600 bhp, and/or one large IC engine, greater than 600 bhp)

Facility Data Input: Input "1" (include IC engine) or "0" (omit IC engine). If the engine is a "non-road" IC engine (thus not stationary), "0" should be selected for fuel.

For distillate fuel oil the default is 0.5% sulfur content by weight. User input is required in "Facility Data Input" for any other sulfur content.

Engine Certification: Input whether or not the IC engine is certified, or is certified to meet EPA Tier 1, Tier 2, Tier 3, Tier 4 or Blue Sky standards.

The EI will use the appropriate EFs for either a large or small diesel-fueled generator. EI summary sheets combine contributions from just one small (< 600 bhp) and/or one large (> 600 bhp) generator.

General Assumptions (see the next tab sheet for specific assumptions for each tab sheet):

This emissions evaluation is based on IDAPA regulatory requirements current as of spreadsheet version date.

EFs are drawn from AP-42 factors available as of spreadsheet version date.

Average brake-specific fuel consumption of 7,000 Btu/hp-hr was assumed to convert from lb/MMBtu to lb/hp-hr.

Average diesel heating value is based on 19,300 Btu/lb with a density of 7.1 lb/gal.

AP-42 EFs for natural gas combustion (Tables 1.4-xx) are based on heat value of 1,020 Btu/scf.

Natural Gas Fuel Heating Value assumed to be 137,030 Btu/gal.

"Reasonable" AP-42 factors are used. Where factors were available in more than one AP-42 section, the estimates are based on the highest of the available factors. For example, AP-42 11.1 EFs for a tank heater burning #2 oil include no information for emissions of PM, NOx, SOx, VOCs, or lead, which is not reasonable. Criteria pollutant EFs from AP-42 1.3, Fuel Oil Combustion, are used instead, and are considered reasonable.

Fugitive Emissions: Fugitive PM emissions from storage piles are typically caused by front-end loader operations that transport the aggregate to the cold feed unit hoppers. Piles of RAP, because RAP is coated with asphalt cement, are not likely to cause significant fugitive dust problems. Aggregate moisture content prior to entry into the dryer is typically 3 percent to 7 percent. This moisture content, along with aggregate size classification, tend to minimize emissions from these sources, which contribute little to total facility PM emissions. PM10 emissions from these sources are reported to account for about 19 percent of their total PM emissions. Source: STAPPA-ALAPCO-EPA, Preferred and Alternative Methods for Estimating Air Emissions from Hot-Mix Asphalt Plants, Final Report, July 1996. DEQ CONCLUSION: Negligible fine PM emissions from RAP. Worst-case fugitive emissions from material handling are for 0% RAP. Assume aggregate/RAP tons = 96% of total HMA tons.

Worksheet Tabs: Letter-Number reflect Location and Order in Statement of Basis

Facility Data Input (primary worksheet for user input of facility-specific parameters)

EmissionInventory lb/hr - Drum dryer baghouse, tank heater, generator, silo filling, and load-out

EmissionInventory TPY - Drum dryer baghouse, tank heater, generator, silo filling, and load-out

Values in Emission Inventories reflect the maximum emissions ONLY from fuel types selected.

FACWIDE TAPs ELs. Used for TAPs EL screening. Includes silo/loadout fugitives.

Lb/hr emissions shown are 24-hr averages for noncarcinogens and annual averages for carcinogens.

Modeling - Criteria Pollutants 1-, 3-, 8-, 24-hour, and annual lb/hr emission rates

Modeling - TAPs 24-hour and annual lb/hr emission rates

Worksheets for Emissions based on Source and Fuel Type:

Drum Dryer Used Oil FabricFilter	Drum Dryer, fired on used oil or RF04 oil
Drum Dryer #2 Oil FabricFilter	Drum Dryer, fired on #2 fuel oil
Drum Dryer NG Fabric Filter	Drum Dryer, natural gas fired
Drum Dryer LPG or Propane FabricFilter	Drum Dryer, LPG or propane-fired
Tank Heater #2 Oil AP-42 1.3, 11.1	Asphalt Tank Heater, fired on #2 fuel oil
Tank Heater NG-AP42 11.1	Asphalt Tank Heater, natural gas fired
Tank Heater NG-AP42 1.4	Asphalt Tank Heater, natural gas fired
Silo Fill Operations	Fugitive emissions based on HMA throughput
Load-out Operations	Fugitive emissions based on HMA throughput
Scalping Screen & Transfer Points (Front-end Loader and Conveyors) - Input # transfer pts, wind speeds & moisture	
IC1 Emission Factors (Selects appropriate EFs for non-certified engines and EPA Tier 1, 2, 3, and Blue Sky engines)	
IC ENGINE 1 < 600 bhp (< 447kW)	#2 Fuel oil fired
IC2 Emission Factors (Selects appropriate EFs for non-certified engines and EPA Tier 1, 2, 3, and Blue Sky engines)	
IC ENGINE 2 > 600 bhp (> 447kW)	#2 Fuel oil fired

DEQ ASSUMPTIONS

DEQ assumptions for the "Drum Dryer UsedOil FabricFilter" Calculations
1. Drum Dryer may be either counter-flow or parallel flow (AP-42 specifies no difference in emissions from either type).
2. SO2 emissions are based on the sulfur content and the Scavenging Factor (varies from 50 to 97%). DEQ used a scavenging factor of 63%. The sulfur content of the three waste oil source tests averaged 0.44 % by weight.

DEQ assumptions for the "Drum Dryer NG FabricFilter" Calculations

DEQ assumptions for the "Drum Dryer #2 Oil FabricFilter" Calculations
1. SO2 emissions are based on the sulfur content and the Scavenging Factor (varies from 50 to 97%). DEQ used a scavenging factor of 63%. The sulfur content of the three waste oil source tests averaged 0.44 % by weight.

DEQ assumptions for the "Drum Dryer LPGProp FabricFilter" Calculations

DEQ assumptions for the "TankHtr #2 Oil-AP42 1.3,11.1" Calculations
1. VOC and TAPs emissions from the asphaltic oil storage tank were determined using Tanks 4.0.9d and the Working and Breathing losses were negligible (less than 1% of total VOC emissions).

DEQ assumptions for the "Tank Heater NG-AP42 11.1" Calculations
1. VOC and TAPs emissions from the asphaltic oil storage tank were determined using Tanks 4.0.9d and the Working and Breathing losses were negligible (less than 1% of total VOC emissions).

DEQ assumptions for the "Tank Heater NG-AP42 1.4" Calculations
1. VOC and TAPs emissions from the asphaltic oil storage tank were determined using Tanks 4.0.9d and the Working and Breathing losses were negligible (less than 1% of total VOC emissions).

DEQ assumptions for the "SiloFIII Criteria&TAPs" Calculations
1. All PM10 is assumed to be PM2.5.

CURRENT PTC APPLICATION VALUES

DEQ Verification Worksheets: Hot Mix Asphalt (HMA) Drum Mix Facility Data			
Facility ID/AIRS No.	777-00533	Spreadsheet Date	7/28/2020 15:46
Permit No.	P-2014.0004	DEQ Version Date	8/2/2018
Facility Owner/Company Name:	Mountain West - 0053		
Address:	4800 Wilkie Road		
City, State, Zip:	Missoula, MT 59808		
Facility Contact:	Josh Smith		
Contact Number/ e-mail:	208-407-8918/josh.smith@kniferiver.com		
		Include Silo Fill & Loadout Emissions?	Y
Use Short Term Source Factor on 586 ELs? Y/N	N	Use T-RACT on 586 AACC? Y/N	N
Hot Mix Plant AP-42 Section 11.1			
	Input (Bold Color) or Calculated Value (Black)	Fuel Type(s)	Fuel Type Toggle ("0" or "1")
Drum Dryer Make/Model	Gencor - Hauck Burner, SJ750	Distillate (#2) Fuel Oil	0
Rated heat input capacity, MMBtu/hr	150	Used Oil or RFO4 Oil	1
Drum Dryer Hourly HMA Production, Tons/hour	350	Natural Gas	1
Max Production Per day, Tons per day	4,000	LPG or Propane	1
Max Annual HMA Production, Tons/year	325,000	Default #2 fuel oil and used oil sulfur content percentage by weight	0.0015% and 0.5%
Min Hours of operation per year (annual/max hourly production)	929	#2 Fuel Oil Max Sulfur Content	0.0015%
		Used Oil/RFO4 Oil Max Sulfur Content	0.1000%
Asphaltic Oil Tank Heater AP-42, Section 11.1 (oil or natural gas fuel), or Section 1.4 (natural gas fuel)			
Rated heat input capacity, MMBtu/hr	0.600	Fuel Type(s)	Fuel Toggle
Hours of operation per day	24	#2 Fuel Oil	0
Operation, days per year (DEQ Assumption)	166.67	Fuel oil sulfur content	0.0015%
Max Hours of operation per year (DEQ Assumption)	4,000	Natural Gas	1
Asphaltic Oil Tank Heater Fuel Consumption Calculations	#2 Fuel Oil	Natural Gas	
Heat Input Rating, MMBtu/hr	0.600	0.600	
Fuel Heating Value, Btu/gal (oil) or Btu/scf (gas)	137,030	1,020	
Heating Value Correction for Natural Gas EFs, see Note	n/a	1.000	
Theoretical Max Fuel Use Rate gal/hr [oil] or scf/hr [gas]	4.38	588	
Max Operational Hours per Year	4,000	4,000	
Note: AP-42 EFs for natural gas and diesel combustion are based on heat value of 1,020 Btu/scf and 137,030 Btu/gal			
IC Engine EI Conversion Factors			
1 hp = 0.7456999 kW	0.7457	1 lb = (g)	453.59
Avg brake-specific fuel consumption (BSFC) = 7000 Btu/hp-hr	7000	Fuel Heating Value, Btu/gal	137,030
Note: AP-42 Tables 3.3-x, 3.4-x: avg. diesel heating value is based on 19,300 Btu/lb with density equal 7.1 lb/gal=> Btu/gal = 137,030			
NOTE: THE HMA EI SUMMARY WORKSHEETS ONLY ALLOWS ONE SMALL AND/OR ONE LARGE IC ENGINE.			
IC Engine 1 < 600 bhp (447 kW) AP-42 Section 3.3 (diesel fueled)			
		Fuel Type(s)	IC Engine Toggle
IC Engine Make/Model		#2 Fuel Oil (Diesel)	
IC Engine Year Manufactured (yyyy)		Max Sulfur weight percentage	
IC Engine Max Rated Power (bhp)		Max Operational Hours/Day	
IC Engine Max Rated Capacity (kW)	0	Max Operational Hours/Year	
IC Engine 1 EPA Certification:		Calculated Max Fuel Use Rate, gal/hr	0.00
Not EPA-certified: Enter "0" (zero)		Calculated MMBtu/hr	0.00
Certified Tier 1, Tier 2, Tier 3, or Tier 4: Enter 1, 2, 3, or 4			
Certified "BLUE SKY" engine: Enter 5			
IC Engine 2 > 600 bhp (447 kW) AP-42 Section 3.4 (diesel fueled)			
		Fuel Type(s)	IC Engine Toggle
IC Engine Make/Model	CAT/C18	#2 Fuel Oil (Diesel)	1
IC Engine Year Manufactured (yyyy)	2015	Max Sulfur weight percentage	0.5000%
IC Engine Rated Capacity (bhp)	672	Max Operational Hours per Day	13
IC Engine Max Rated Capacity (kW)	501	Max Operational Hours per Year	8,760
IC Engine 2 EPA Certification:		Calculated Max Fuel Use Rate, gal/hr	34.33
Not EPA-certified: Enter "0" (zero)	4	Calculated MMBtu/hr	4.70
Certified Tier 1, Tier 2, Tier 3, or Tier 4: Enter 1, 2, 3, or 4			
Certified "BLUE SKY" engine: Enter 5			
Aggregate Handling - Fugitive Emissions			
U = mean wind speed (miles per hour)	10		
Moisture/Control % Considerations:			
AP-42 Table 11.19.2-2, Note b. Moisture content of uncontrolled sources ranged from 0.21 to 1.3%			
AP-42 Table 11.19.2-2, Note b. Moisture content of controlled (water spray) sources ranged from 0.55 to 2.88% -->			
		--> ~91.3% control for screening, ~95% control for convey	
M = moisture content (%)	3	Bulk aggregate for HMA typically stabilizes at 3 to 5% by weight.	
If higher moisture is maintained, apply additional % control:	90.00%	For M=3% add 10% control. For M=5% add 15% control. 90% cor	
Number of front-end loader drop points (aggregate and RAP) (DEQ Assumption)	2	Drops to storage pile(s) and drop(s) to bins	
Aggregate weigh conveyor transfer points (DEQ Assumption)	2	Transfer from bins to conveyor & from conveyor to scalping screen	

Used Oil Fired Drum Mix Asphalt Plant With Fabric Filter AP-42 Section 11.1

Fuel Type Toggle = 1
 Max Hourly Production 350 T/hr
 Max Daily Production 4,000 Tons/day
 Max Annual Production 325,000 Tons/yr

User Input Weight % Sulfur = 0.1000%
 AP-42 EF of 0.058 lb SO₂/ton presumed based on #2 oil, max 0.5% sulfur content
 SO₂ emissions are multiplied by a factor: User Input Value/0.5% = 0.20

Pollutant	Emission Factor ^a (lb/ton)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PM (total) ^b	0.033	11.55	5.36	
PM-10 (total) ^b	0.023	8.05	3.74	
PM-2.5 ^{b1}	0.0223	7.81	3.62	
CO ^c	0.13	45.50	21.13	
NOx ^c	0.055	19.25	8.94	
SO ₂ ^c	0.089	6.23	2.89	
VOC ^d	0.032	11.20	5.20	
Lead	1.50E-05	5.25E-03	2.44E-03	
HCl ^{g,h}	0.00021	0.0735	3.41E-02	
Dioxins^f				
2,3,7,8-TCDD	2.10E-13	7.35E-11	3.41E-11	7.79E-12
Total TCDD	9.30E-13	3.26E-10	1.51E-10	3.45E-11
1,2,3,7,8-PeCDD	3.10E-13	1.09E-10	5.04E-11	1.15E-11
Total PeCDD	2.20E-11	7.70E-09	3.58E-09	8.16E-10
1,2,3,4,7,8-HxCDD	4.20E-13	1.47E-10	6.83E-11	1.56E-11
1,2,3,6,7,8-HxCDD	1.30E-12	4.55E-10	2.11E-10	4.82E-11
1,2,3,7,8,9-HxCDD	9.80E-13	3.43E-10	1.59E-10	3.64E-11
Total HxCDD	1.20E-11	4.20E-09	1.95E-09	4.45E-10
1,2,3,4,6,7,8-HpCDD	4.80E-12	1.68E-09	7.80E-10	1.78E-10
Total HpCDD	1.90E-11	6.65E-09	3.09E-09	7.05E-10
Octa CDD	2.50E-11	8.75E-09	4.06E-09	9.28E-10
Total PCDD^f	7.90E-11	2.77E-08	1.28E-08	2.93E-09
Furans^f				
2,3,7,8-TCDF	9.70E-13	3.40E-10	1.58E-10	3.60E-11
Total TCDF	3.70E-12	1.30E-09	6.01E-10	1.37E-10
1,2,3,7,8-PeCDF	4.30E-12	1.51E-09	6.99E-10	1.60E-10
2,3,4,7,8-PeCDF	8.40E-13	2.94E-10	1.37E-10	3.12E-11
Total PeCDF	8.40E-11	2.94E-08	1.37E-08	3.12E-09
1,2,3,4,7,8-HxCDF	4.00E-12	1.40E-09	6.50E-10	1.48E-10
1,2,3,6,7,8-HxCDF	1.20E-12	4.20E-10	1.95E-10	4.45E-11
2,3,4,6,7,8-HxCDF	1.90E-12	6.65E-10	3.09E-10	7.05E-11
1,2,3,7,8,9-HxCDF	8.40E-12	2.94E-09	1.37E-09	3.12E-10
Total HxCDF	1.30E-11	4.55E-09	2.11E-09	4.82E-10
1,2,3,4,6,7,8-HpCDF	6.50E-12	2.28E-09	1.06E-09	2.41E-10
1,2,3,4,7,8,9-HpCDF	2.70E-12	9.45E-10	4.39E-10	1.00E-10
Total HpCDF	1.00E-11	3.50E-09	1.63E-09	3.71E-10
Octa CDF	4.80E-12	1.68E-09	7.80E-10	1.78E-10
Total PCDF^f	4.00E-11	1.40E-08	6.50E-09	1.48E-09
Total PCDD/PCDF^f	1.20E-10	4.20E-08	1.95E-08	4.45E-09
Non-PAH HAPs^f				
Acetaldehyde^e	1.30E-03	4.55E-01	2.11E-01	4.82E-02
Acrolein^e	2.60E-05	9.10E-03	4.23E-03	4.33E-03
Benzene^e	3.90E-04	1.37E-01	6.34E-02	1.45E-02
1,3-Butadiene^e				
Ethylbenzene^e	2.40E-04	8.40E-02	3.90E-02	4.00E-02
Formaldehyde^e	3.10E-03	1.09E+00	5.04E-01	1.15E-01
Hexane^e	9.20E-04	3.22E-01	1.50E-01	1.53E-01
Isocetane^e	4.00E-05	1.40E-02	6.50E-03	6.67E-03
Methyl Ethyl Ketone^e	2.00E-05	7.00E-03	3.25E-03	3.33E-03
Pentane^e				
Propionaldehyde^e	1.30E-04	4.55E-02	2.11E-02	2.17E-02
Quinone^e	1.60E-04	5.60E-02	2.60E-02	2.67E-02
Methyl chloroform^e	4.80E-05	1.68E-02	7.80E-03	8.00E-03
Toluene^e	2.90E-03	1.02E+00	4.71E-01	4.83E-01
Xylene^e	2.00E-04	7.00E-02	3.25E-02	3.33E-02
POM (7-PAH Group)		1.92E-04		2.03E-05

Pollutant	Emission Factor ^a (lb/ton)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PAH HAPs^f				
2-Methylnaphthalene	1.70E-04	5.95E-02	2.76E-02	6.31E-03
3-Methylchloranthrene^e				
Acenaphthene	1.40E-06	4.90E-04	2.28E-04	5.19E-05
Acenaphthylene	2.20E-05	7.70E-03	3.58E-03	8.16E-04
Anthracene	3.10E-06	1.09E-03	5.04E-04	1.15E-04
Benzo(a)anthracene	2.10E-07	7.35E-05	3.41E-05	7.79E-06
Benzo(a)pyrene^e	9.80E-09	3.43E-06	1.59E-06	3.64E-07
Benzo(b)fluoranthene	1.00E-07	3.50E-05	1.63E-05	3.71E-06
Benzo(e)pyrene	1.10E-07	3.85E-05	1.79E-05	4.08E-06
Benzo(g,h,i)perylene	4.00E-08	1.40E-05	6.50E-06	1.48E-06
Benzo(k)fluoranthene	4.10E-08	1.44E-05	6.66E-06	1.52E-06
Chrysene	1.80E-07	6.30E-05	2.93E-05	6.68E-06
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene	6.10E-07	2.14E-04	9.91E-05	2.26E-05
Fluorene	1.10E-05	3.85E-03	1.79E-03	4.08E-04
Indeno(1,2,3-cd)pyrene	7.00E-09	2.45E-06	1.14E-06	2.60E-07
Naphthalene^e	6.50E-04	2.28E-01	1.06E-01	2.41E-02
Perylene	8.80E-09	3.08E-06	1.43E-06	3.26E-07
Phenanthrene	2.30E-05	8.05E-03	3.74E-03	8.53E-04
Pyrene	3.00E-06	1.05E-03	4.88E-04	1.11E-04
Non-HAP Organic Compounds^f				
Acetone^e	8.30E-04	2.91E-01	1.35E-01	1.38E-01
Benzaldehyde	1.10E-04	3.85E-02	1.79E-02	1.83E-02
Butane	6.70E-04	2.35E-01	1.09E-01	1.12E-01
Butyraldehyde	1.60E-04	5.60E-02	2.60E-02	2.67E-02
Crotonaldehyde^e	8.60E-05	3.01E-02	1.40E-02	1.43E-02
Ethylene	7.00E-03	2.45E+00	1.14E+00	1.17E+00
Heptane	9.40E-03	3.29E+00	1.53E+00	1.57E+00
Hexanal	1.10E-04	3.85E-02	1.79E-02	1.83E-02
Isovaleraldehyde	3.20E-05	1.12E-02	5.20E-03	5.33E-03
2-Methyl-1-pentene	4.00E-03	1.40E+00	6.50E-01	6.67E-01
2-Methyl-2-butene	5.80E-04	2.03E-01	9.43E-02	9.67E-02
3-Methylpentane	1.90E-04	6.65E-02	3.09E-02	3.17E-02
1-Pentene	2.20E-03	7.70E-01	3.58E-01	3.67E-01
n-Pentane	2.10E-04	7.35E-02	3.41E-02	3.50E-02
Valeraldehyde^e	6.70E-05	2.35E-02	1.09E-02	1.12E-02
Metals^g				
Antimony^g	1.80E-07	6.30E-05	2.93E-05	3.00E-05
Arsenic^g	5.60E-07	1.96E-04	9.10E-05	2.08E-05
Barium^g	5.80E-06	2.03E-03	9.43E-04	9.67E-04
Beryllium^g				
Cadmium^g	4.10E-07	1.44E-04	6.66E-05	1.52E-05
Chromium^g	5.50E-06	1.93E-03	8.94E-04	9.17E-04
Cobalt^g	2.60E-08	9.10E-06	4.23E-06	4.33E-06
Copper^g	3.10E-06	1.09E-03	5.04E-04	5.17E-04
Hexavalent Chromium^g	4.50E-07	1.58E-04	7.31E-05	1.67E-05
Manganese^g	7.70E-06	2.70E-03	1.25E-03	1.28E-03
Mercury^g	2.60E-06	9.10E-04	4.23E-04	4.33E-04
Molybdenum^g				
Nickel^g	6.30E-05	2.21E-02	1.02E-02	2.34E-03
Phosphorus^g	2.80E-05	9.80E-03	4.55E-03	4.67E-03
Silver^g	4.80E-07	1.68E-04	7.80E-05	8.00E-05
Selenium^g	3.50E-07	1.23E-04	5.69E-05	5.83E-05
Thallium^g	4.10E-09	1.44E-06	6.66E-07	6.83E-07
Vanadium^g				
Zinc^g	6.10E-05	2.14E-02	9.91E-03	1.02E-02

a) Emission factors are from AP-42 11.1, Hot Mix Asphalt Plants, 3/04
 b) AP-42, Table 11.1-3, Particulate Matter Emission Factors for Drum Mix Hot Asphalt Plants, 3/04
 b1) AP-42, Table 11.1-4, Summary of Particle Size Distribution for Drum Mix Dryers (Emission Rating Factor E - "Poor")
 c) AP-42, Table 11.1-7, Emission Factors for CO, CO₂, NO_x, and SO₂ from Drum Mix Hot Asphalt Plants, 3/04
 In addition, for SO₂ emissions the AP-42 EF of 0.058 lb/ton was adjusted twice. First, to account for the average sulfur content of the fuel used during the source test (0.44% by weight, three tests on waste oil), 0.058 to 0.066. Second, to account for the average scavenging factor of 63% down to 50%, 0.062 to 0.089.
 d) AP-42, Table 11.1-8, Emission Factors for TOC, Methane, VOC, and HCl from Drum Mix Hot Asphalt Plants, 3/04
 e) IDAPA Toxic Air Pollutant
 f) AP-42, Table 11.1-10, Emission Factors for Organic Pollutant Emissions from Drum Mix Hot Asphalt Plants, 3/04
 g) AP-42, Table 11.1-12, Emission Factors for Metal Emissions from Drum Mix Hot Mix Asphalt Plants, 3/04
 h) Compound is classified as polycyclic organic matter, as defined in the 1990 CAAA. Total PCDD is the sum of the total tetra through octa dioxins; total PCDF is sum of the total tetra through octa furans; and total PCDD/PCDF is the sum of total PCDD and total PCDF.
 Pollutants shown in bold/blue text are emitted when using Used Oil but not when using #2 Fuel Oil or Natural Gas.
 Pollutants shown in magenta are emitted when using Used Oil or #2 Fuel Oil, but not when using Natural Gas
TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.
Pollutants shown in blue text are emitted only when burning Used Oil, but not when burning #2 Fuel Oil or Natural Gas

Facility: Knife River Corporation - Mountain West - 0053
 7/28/2020 15:46 Permit/Facility ID: P-2014.0004 777-00533

#2 Fuel Oil Fired Drum Mix Asphalt Plant With Fabric Filter AP-42 Section 11.1

Fuel Type Toggle = 0
 Hourly Production 350 T/hr
 Daily Production 4,000 Tons/day
 Max Annual Production 325,000 Tons/yr

User Input Weight % Sulfur = 0.0015%
 AP-42 EF of 0.058 lb SO2/ton presumed based on #2 oil, max 0.5% sulfur content
 SO2 emissions are multiplied by a factor: User Input Value/0.5% = 0.003

Pollutant	Emission Factor ^a (lb/ton)	Emissions (lb/hr) Maximum	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PM (total) ^b	0.033	0.00	0.00	
PM-10 (total) ^b	0.023	0.00	0.00	
PM-2.5 ⁿⁱ	0.0223	0.00	0.00	
CO ^c	0.13	0.00	0.00	
NOx ^c	0.055	0.00	0.00	
SO ₂ ^c	0.089	0.00	0.00	
VOC ^d	0.032	0.00	0.00	
Lead	1.50E-05	0.00E+00	0.00E+00	
HCl ^{de}	No Data			
Dioxins^e				
2,3,7,8-TCDD	2.10E-13	0	0.00E+00	0.00E+00
Total TCDD	9.30E-13	0	0.00E+00	0.00E+00
1,2,3,7,8-PeCDD	3.10E-13	0	0.00E+00	0.00E+00
Total PeCDD	2.20E-11	0	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDD	4.20E-13	0	0.00E+00	0.00E+00
1,2,3,6,7,8-HxCDD	1.30E-12	0	0.00E+00	0.00E+00
1,2,3,7,8,9-HxCDD	9.80E-13	0	0.00E+00	0.00E+00
Total HxCDD	1.20E-11	0	0.00E+00	0.00E+00
1,2,3,4,6,7,8-Hp-CDD	4.80E-12	0	0.00E+00	0.00E+00
Total HpCDD	1.90E-11	0	0.00E+00	0.00E+00
Octa CDD	2.50E-11	0	0.00E+00	0.00E+00
Total PCDD ^h	7.90E-11	0	0.00E+00	0.00E+00
Furans^e				
2,3,7,8-TCDF	9.70E-13	0	0.00E+00	0.00E+00
Total TCDF	3.70E-12	0	0.00E+00	0.00E+00
1,2,3,7,8-PeCDF	4.30E-12	0	0.00E+00	0.00E+00
2,3,4,7,8-PeCDF	8.40E-13	0	0.00E+00	0.00E+00
Total PeCDF	8.40E-11	0	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDF	4.00E-12	0	0.00E+00	0.00E+00
1,2,3,6,7,8-HxCDF	1.20E-12	0	0.00E+00	0.00E+00
2,3,4,6,7,8-HxCDF	1.90E-12	0	0.00E+00	0.00E+00
1,2,3,7,8,9-HxCDF	8.40E-12	0	0.00E+00	0.00E+00
Total HxCDF	1.30E-11	0	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDF	6.50E-12	0	0.00E+00	0.00E+00
1,2,3,4,7,8,9-HpCDF	2.70E-12	0	0.00E+00	0.00E+00
Total HpCDF	1.00E-11	0	0.00E+00	0.00E+00
Octa CDF	4.80E-12	0	0.00E+00	0.00E+00
Total PCDF ^h	4.00E-11	0	0.00E+00	0.00E+00
Total PCDD/PCDF ^h	1.20E-10	0	0.00E+00	0.00E+00
Non-PAH HAPs^f				
Acetaldehyde ^e				
Acrolein ^e				
Benzene ^e	3.90E-04	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene ^e				
Ethylbenzene ^e	2.40E-04	0.00E+00	0.00E+00	0.00E+00
Formaldehyde ^e	3.10E-03	0.00E+00	0.00E+00	0.00E+00
Hexane ^e	9.20E-04	0.00E+00	0.00E+00	0.00E+00
Isooctane	4.00E-05	0.00E+00	0.00E+00	0.00E+00
Methyl Ethyl Ketone ^e				
Pentane ^e				
Propionaldehyde ^e				
Quinone ^e				
Methyl chloroform ^e	4.80E-05	0.00E+00	0.00E+00	0.00E+00
Toluene ^e	2.90E-03	0.00E+00	0.00E+00	0.00E+00
Xylene ^e	2.00E-04	0.00E+00	0.00E+00	0.00E+00
POM (7-PAH Group)		0.00E+00		0.00E+00

Pollutant	Emission Factor ^a (lb/ton)	Emissions (lb/hr) Maximum	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PAH HAPs^f				
2-Methylnaphthalene	0.00017	0.00E+00	0.00E+00	0.00E+00
3-Methylchloranthrene ^e				
Acenaphthene	1.40E-06	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene	2.20E-05	0.00E+00	0.00E+00	0.00E+00
Anthracene	3.10E-06	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene	2.10E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(a)pyrene ^e	9.80E-09	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	1.00E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(e)pyrene	1.10E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(g,h,i)perylene	4.00E-08	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	4.10E-08	0.00E+00	0.00E+00	0.00E+00
Chrysene	1.80E-07	0.00E+00	0.00E+00	0.00E+00
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene	6.10E-07	0.00E+00	0.00E+00	0.00E+00
Fluorene	1.10E-05	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	7.00E-09	0.00E+00	0.00E+00	0.00E+00
Naphthalene ^e	0.00065	0.00E+00	0.00E+00	0.00E+00
Perylene	8.80E-09	0.00E+00	0.00E+00	0.00E+00
Phenanthrene	2.30E-05	0.00E+00	0.00E+00	0.00E+00
Pyrene	3.00E-06	0.00E+00	0.00E+00	0.00E+00
Non-HAP Organic Compounds^f				
Acetone ^e				
Benzaldehyde				
Butane	6.70E-04	0.00E+00	0.00E+00	0.00E+00
Butyraldehyde				
Crotonaldehyde ^e				
Ethylene	7.00E-03	0.00E+00	0.00E+00	0.00E+00
Heptane	9.40E-03	0.00E+00	0.00E+00	0.00E+00
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene	4.00E-03	0.00E+00	0.00E+00	0.00E+00
2-Methyl-2-butene	5.80E-04	0.00E+00	0.00E+00	0.00E+00
3-Methylpentane	1.90E-04	0.00E+00	0.00E+00	0.00E+00
1-Pentene	2.20E-03	0.00E+00	0.00E+00	0.00E+00
n-Pentane	2.10E-04	0.00E+00	0.00E+00	0.00E+00
Valeraldehyde				
Metals^g				
Antimony ^e	1.80E-07	0.00E+00	0.00E+00	0.00E+00
Arsenic ^e	5.60E-07	0.00E+00	0.00E+00	0.00E+00
Barium ^e	5.80E-06	0.00E+00	0.00E+00	0.00E+00
Beryllium ^e				
Cadmium ^e	4.10E-07	0.00E+00	0.00E+00	0.00E+00
Chromium ^e	5.50E-06	0.00E+00	0.00E+00	0.00E+00
Cobalt ^e	2.60E-08	0.00E+00	0.00E+00	0.00E+00
Copper ^e	3.10E-06	0.00E+00	0.00E+00	0.00E+00
Hexavalent Chromium ^e	4.50E-07	0.00E+00	0.00E+00	0.00E+00
Manganese ^e	7.70E-06	0.00E+00	0.00E+00	0.00E+00
Mercury ^e	2.60E-06	0.00E+00	0.00E+00	0.00E+00
Molybdenum ^e				
Nickel ^e	6.30E-05	0.00E+00	0.00E+00	0.00E+00
Phosphorus ^e	2.80E-05	0.00E+00	0.00E+00	0.00E+00
Silver ^e	4.80E-07	0.00E+00	0.00E+00	0.00E+00
Selenium ^e	3.50E-07	0.00E+00	0.00E+00	0.00E+00
Thallium ^e	4.10E-09	0.00E+00	0.00E+00	0.00E+00
Vanadium ^e				
Zinc ^e	6.10E-05	0.00E+00	0.00E+00	0.00E+00

- a) Emission factors are from AP-42 11.1, Hot Mix Asphalt Plants, 3/04
- b) AP-42, Table 11.1-3, Particulate Matter Emission Factors for Drum Mix Hot Asphalt Plants, 3/04
- b1) AP-42, Table 11.1-4, Summary of Particle Size Distribution for Drum Mix Dryers (Emission Rating Factor E - "Poor")
- c) AP-42, Table 11.1-7, Emission Factors for CO, CO2, NOx, and SO2 from Drum Mix Hot Asphalt Plants, 3/04
 In addition, for SO2 emissions the AP-42 EF of 0.058 lb/ton was adjusted twice. First, to account for the average sulfur content of the fuel used during the source test (0.44% by weight, three tests on waste oil), 0.058 to 0.066. Second, to account for the average scavenging factor of 63% down to 50%, 0.062 to 0.089.
- d) AP-42, Table 11.1-8, Emission Factors for TOC, Methane, VOC, and HCl from Drum Mix Hot Asphalt Plants, 3/04
- e) IDAPA Toxic Air Pollutant
- f) AP-42, Table 11.1-10, Emission Factors for Organic Pollutant Emissions from Drum Mix Hot Asphalt Plants, 3/04
- g) AP-42, Table 11.1-12, Emission Factors for Metal Emissions from Drum Mix Hot Asphalt Plants, 3/04
- h) Compound is classified as polycyclic organic matter, as defined in the 1990 CAAA. Total PCDD is the sum of the total tetra through octa dioxins; total PCDF is sum of the total tetra through octa furans; and total PCDD/PCDF is the sum of total PCDD and total PCDF.

TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Asphalt Tank Heater - #2 Oil Fired, Estimated Emissions Using AP-42 Sections 11.1 (HMA Plants) & 1.3 (Fuel Oil Combustion)

Fuel Type Toggle = 0
 Fuel Consumption Rate = 4.38 gal/hr
 Max Daily Operation = 24 hr/day
 Max Annual Operation = 4,000 hrs/yr

User Input Weight % Sulfur = 0.0015%
 AP-42 1.3-1 EF is 0.142S lb SO₂ per gallon of fuel oil

Pollutant	Emission Factor ^a (lb/gal)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PM (total) ^b (filterable+cond)	0.0033	0.00E+00	0.00	
PM-10 (total) ^b (filterable+cond)	0.0023	0.00E+00	0.00	
PM-2.5 (total) ^b (filterable+cond)	0.00154	0.000	0.00	
CO ^b (*C* EF Rating Factor)	0.005	0.00E+00	0.00	
NOx ^b	0.024	0.00E+00	0.00	
SO ₂ ^b	0.000213	0.00	0.00	
VOC ^d (NMTOC EF)	5.56E-04	0.00E+00	0.00E+00	
Lead ^f	1.51E-06	0.00E+00	0.00E+00	
HCl ^e				
Dioxins^e				
2,3,7,8-TCDD				
Total TCDD				
1,2,3,7,8-PeCDD				
Total PeCDD				
1,2,3,4,7,8-HxCDD^e	6.90E-13	0.00E+00	0.00E+00	0.00E+00
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD^e	7.60E-13	0.00E+00	0.00E+00	0.00E+00
Total HxCDD				
1,2,3,4,6,7,8-HpCDD^e	1.50E-11	0.00E+00	0.00E+00	0.00E+00
Total HpCDD^e	2.00E-11	0.00E+00	0.00E+00	0.00E+00
Octa CDD^e	1.60E-10	0.00E+00	0.00E+00	0.00E+00
Total PCDD^e	2.00E-10	0.00E+00	0.00E+00	0.00E+00
Furans^e				
2,3,7,8-TCDF				
Total TCDF^e	3.30E-12	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF^e	4.80E-13	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDF				
1,2,3,6,7,8-HxCDF				
2,3,4,6,7,8-HxCDF				
1,2,3,7,8,9-HxCDF				
Total HxCDF^e	2.00E-12	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF^e	9.70E-12	0.00E+00	0.00E+00	0.00E+00
Octa CDF^e	1.20E-11	0.00E+00	0.00E+00	0.00E+00
Total PCDF^e	3.10E-11	0.00E+00	0.00E+00	0.00E+00
Total PCDD/PCDF^e	2.30E-10	0.00E+00	0.00E+00	0.00E+00
Non-PAH HAPs				
Acetaldehyde^e				
Acrolein^e				
Benzene^e				
1,3-Butadiene^e				
Ethylbenzene^e				
Formaldehyde^{e,g}	3.50E-06	0.00E+00	0.00E+00	0.00E+00
Hexane^e				
Isooctane				
Methyl Ethyl Ketone^e				
Pentane^e				
Propionaldehyde^e				
Quinone^e				
Methyl chloroform^e				
Toluene^e				
Xylene^e				
POM (7-PAH Group)		0.00E+00		0.00E+00

Pollutant	Emission Factor ^a (lb/gal)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PAH HAPs				
2-Methylnaphthalene				
3-Methylchloranthrene^e				
Acenaphthene^c	5.30E-07	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene^c	2.00E-07	0.00E+00	0.00E+00	0.00E+00
Anthracene^c	1.80E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene				
Benzo(a)pyrene^e				
Benzo(b)fluoranthene^c	1.00E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(e)pyrene				
Benzo(g,h,i)perylene				
Benzo(k)fluoranthene				
Chrysene				
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene^c	4.40E-08	0.00E+00	0.00E+00	0.00E+00
Fluorene^c	3.20E-08	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene				
Naphthalene^{e,g}	1.70E-05	0.00E+00	0.00E+00	0.00E+00
Perylene				
Phenanthrene^c	4.90E-06	0.00E+00	0.00E+00	0.00E+00
Pyrene^c	3.20E-08	0.00E+00	0.00E+00	0.00E+00
Non-HAP Organic Compounds				
Acetone^e				
Benzaldehyde				
Butane				
Butyraldehyde				
Crotonaldehyde^e				
Ethylene				
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				
Valeraldehyde				
Metals^e				
Antimony^e	5.25E-06	0.00E+00	0.00E+00	0.00E+00
Arsenic^e	1.32E-06	0.00E+00	0.00E+00	0.00E+00
Barium^e	2.57E-06	0.00E+00	0.00E+00	0.00E+00
Beryllium^e	2.78E-08	0.00E+00	0.00E+00	0.00E+00
Cadmium^e	3.98E-07	0.00E+00	0.00E+00	0.00E+00
Chromium^e	8.45E-07	0.00E+00	0.00E+00	0.00E+00
Cobalt^e	6.02E-06	0.00E+00	0.00E+00	0.00E+00
Copper^e	1.76E-06	0.00E+00	0.00E+00	0.00E+00
Hexavalent Chromium^e	2.48E-07	0.00E+00	0.00E+00	0.00E+00
Manganese^e	3.00E-06	0.00E+00	0.00E+00	0.00E+00
Mercury^e	1.13E-07	0.00E+00	0.00E+00	0.00E+00
Molybdenum^e	7.87E-07	0.00E+00	0.00E+00	0.00E+00
Nickel^e	8.45E-05	0.00E+00	0.00E+00	0.00E+00
Phosphorus^e	9.46E-06	0.00E+00	0.00E+00	0.00E+00
Silver^e				
Selenium^e	6.83E-07	0.00E+00	0.00E+00	0.00E+00
Thallium^e				
Vanadium^e	3.18E-05	0.00E+00	0.00E+00	0.00E+00
Zinc^e	2.91E-05	0.00E+00	0.00E+00	0.00E+00

a) Emission factors for criteria pollutants are from AP-42, 1.3, Fuel Oil Combustion, 9/98; all other factors are from AP-42 11.1, Hot Mix Asphalt Plants, 3/04
 b) AP-42, Table 1.3-1, Criteria Pollutant Emission Factors for Fuel Oil Combustion, 9/98; Boilers < 100 MMBtu, SO_x based on max fuel sulfur content, PM₁₀ is 1.3 lb/1,000 gal + 50% of 2.0 lb/1,000 gal
 c) AP-42, Table 11.1-13, Emission Factors for Hot Mix Asphalt Hot Oil Systems, 3/04
 d) AP-42, Table 1.3-3, Emission Factors for Total Organic Compounds (TOC), Methane, and Nonmethane TOC (NMTOC) from Uncontrolled Distillate Fuel Oil Combustion; Commercial Boiler
 e) IDAPA Toxic Air Pollutant
 f) AP-42, Table 1.3-11, Emission Factors for Metals from Uncontrolled No. 6 Fuel Oil Combustion
TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Facility: Knife River Corporation - Mountain West - 0053
 7/28/2020 15:46 Permit/Facility ID: P-2014.0004 777-00533

Silo Filling Operations AP-42 Section 11.1

Emissions Toggle = 1
 Max Hourly Production 350 T/hr
 Max Daily Production 4,000 Tons/day
 Max Annual Production 325,000 Tons/yr

Pollutant	Emission Factor ^a Silo Fill (lb/ton)	Emissions (lb/hr) 1-hr Average	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PM (total) ^b	5.86E-04	0.2051	0.0952	
PM-10 (total) ^b	5.86E-04	0.2051	0.0952	
PM-2.5 ^b	5.86E-04	0.2051	0.0952	
CO ^b	1.18E-03	0.4130	0.1917	
NOx				
SO ₂				
VOC ^{c,g}	1.22E-04	4.27E-02	0.0198	
Lead				
HCl ^{d,w}	No Data			
Dioxins^e				
2,3,7,8-TCDD				
Total TCDD				
1,2,3,7,8-PeCDD				
Total PeCDD				
1,2,3,4,7,8-HxCDD				
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD				
Total HxCDD				
1,2,3,4,6,7,8-HpCDD				
Total HpCDD				
Octa CDD				
Total PCDD^h				
Furans^e				
2,3,7,8-TCDF				
Total TCDF				
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF				
1,2,3,4,7,8-HxCDF				
1,2,3,6,7,8-HxCDF				
2,3,4,6,7,8-HxCDF				
1,2,3,7,8,9-HxCDF				
Total HxCDF				
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF				
Octa CDF				
Total PCDF^h				
Total PCDD/PCDF^h				
Non-PAH HAPs				
Acetaldehyde^e				
Acrolein ^e				
Benzene^e	3.90E-06	1.36E-03	6.34E-04	0.0001
1,3-Butadiene^e				
Ethylbenzene^e	4.63E-06	1.62E-03	7.53E-04	7.72E-04
Formaldehyde^e	8.41E-05	2.94E-02	1.37E-02	0.0031
Hexane^e	1.22E-05	4.27E-03	1.98E-03	2.03E-03
Isooctane	3.78E-08	1.32E-05	6.14E-06	6.30E-06
Methyl Ethyl Ketone^e	4.75E-06	1.66E-03	7.72E-04	7.92E-04
Pentane^e				
Propionaldehyde^e				
Quinone^e				
Methyl chloroform^e		0.00E+00	0.00E+00	
Toluene^e	7.56E-06	2.64E-03	1.23E-03	1.26E-03
Xylene^e	3.13E-05	1.10E-02	5.09E-03	5.22E-03
PM (7-PAH Group)		2.36E-04		2.51E-05

Pollutant	Emission Factor ^a Silo Fill (lb/ton)	Emissions (lb/hr) 1-hr Average	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PAH HAPsⁱ				
2-Methylnaphthalene	1.34E-05	4.68E-03	2.17E-03	4.96E-04
3-Methylchloranthrene^e				
Acenaphthene	1.19E-06	4.18E-04	1.94E-04	4.43E-05
Acenaphthylene	3.55E-08	1.24E-05	5.78E-06	1.32E-06
Anthracene	3.30E-07	1.16E-04	5.36E-05	1.22E-05
Benzo(a)anthracene	1.42E-07	4.98E-05	2.31E-05	5.27E-06
Benzo(a)pyrene^e	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(e)pyrene	2.41E-08	8.44E-06	3.92E-06	8.95E-07
Benzo(g,h,i)perylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chrysene	5.33E-07	1.87E-04	8.66E-05	1.98E-05
Dibenz(a,h)anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dichlorobenzene				
Fluoranthene	3.81E-07	1.33E-04	6.19E-05	1.41E-05
Fluorene	2.56E-06	8.97E-04	4.17E-04	9.51E-05
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Naphthalene^e	4.62E-06	1.62E-03	7.51E-04	1.71E-04
Perylene	7.62E-08	2.67E-05	1.24E-05	2.83E-06
Phenanthrene	4.57E-06	1.60E-03	7.43E-04	1.70E-04
Pyrene	1.12E-06	3.91E-04	1.82E-04	4.14E-05
Non-HAP Organic Compounds				
Acetone^e	6.70E-06	2.35E-03	0.0011	1.12E-03
Benzaldehyde				
Butane				
Butylaldehyde				
Crotonaldehyde^e				
Ethylene	1.34E-04	4.69E-02	0.0218	2.23E-02
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				
Valeraldehyde				
Metals				
Antimony^e				
Arsenic^e				
Barium^e				
Beryllium^e				
Cadmium^e				
Chromium^e				
Cobalt^e				
Copper^e				
Hexavalent Chromium^e				
Manganese^e				
Mercury^e				
Molybdenum^e				
Nickel^e				
Phosphorus^e				
Silver^e				
Selenium^e				
Thallium^e				
Vanadium^e				
Zinc^e				

a) Emission factors are from AP-42 11.1, Hot Mix Asphalt Plants, 3/04

b) AP-42, Table 11.1-14, Predictive Emission Factor Equations for Load-Out and Silo Filling Operations, 3/04 Defaults: (-V) = 0.5 T (°F) = 325

	LOADOUT	SILO FILL
Total PM EF = 0.000181+0.00141(-V)e ^{((0.0251)(T+460)-20.43)} + 0.00332+ 0.00105(-V)e ^{((0.0251)(T+460)-20.43)} =	5.219E-04	5.859E-04 (split addends)
Organic PM EF = 0.00141(-V)e ^{((0.0251)(T+460)-20.43)} + 0.00105(-V)e ^{((0.0251)(T+460)-20.43)} =	3.409E-04	2.539E-04 (split addends)
TOC PM EF = 0.0172(-V)e ^{((0.0251)(T+460)-20.43)} + 0.0504(-V)e ^{((0.0251)(T+460)-20.43)} =	4.159E-03	1.219E-02 (split addends)
CO PM EF = 0.00558(-V)e ^{((0.0251)(T+460)-20.43)} + 0.00488(-V)e ^{((0.0251)(T+460)-20.43)} =	1.349E-03	1.180E-03 (split addends)

e) IDAPA Toxic Air Pollutant

f) AP-42, Table 11.1-15, Speciation Profiles for Load-out, Silo Filling, & Asphalt Storage--Organic Particulate-Based Compounds, 3/04 (EF=Spec% * Organic PM EF)

g) AP-42, Table 11.1-16, Speciation Profiles for Load-out, Silo Filling, & Asphalt Storage--Organic Volatile-Based Compounds, 3/04, (EF=Spec% * TOC PM EF)

Pollutants shown in bold text are carcinogens subject to an annual standard. These lb/hr values are annual averages.

Pollutants shown in blue text are organic volatile-based compounds, EF = Spec% x TOC PM EF.

Facility: Knife River Corporation - Mountain West - 0053
 7/28/2020 15:46 Permit/Facility ID: P-2014.0004 777-00533

Load-out Operations AP-42 Section 11.1

Emissions Toggle = 1
 Max Hourly Production 350 T/hr
 Max Daily Production 4,000 Tons/day
 Max Annual Production 325,000 Tons/yr

Pollutant	Emission Factor ^a (lb/ton)	Emissions (lb/hr) 1-hr Average	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PM (total) ^b	5.22E-04	0.183	0.08	
PM-10 (total) ^b	5.22E-04	0.183	0.08	
PM-2.5 ^a	5.22E-04	0.183	0.08	
CO ^b	1.35E-03	0.472	0.22	
NOx				
SO ₂				
VOC ^{c,g}	3.91E-03	1.368	0.64	
Lead				
HCl ^{d,e}	No Data			
Dioxins^o				
2,3,7,8-TCDD				
Total TCDD				
1,2,3,7,8-PeCDD				
Total PeCDD				
1,2,3,4,7,8-HxCDD				
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD				
Total HxCDD				
1,2,3,4,6,7,8-Hp-CDD				
Total HpCDD				
Octa CDD				
Total PCDD^h				
Furans^o				
2,3,7,8-TCDF				
Total TCDF				
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF				
1,2,3,4,7,8-HxCDF				
1,2,3,6,7,8-HxCDF				
2,3,4,6,7,8-HxCDF				
1,2,3,7,8,9-HxCDF				
Total HxCDF				
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF				
Octa CDF				
Total PCDF^h				
Total PCDD/PCDF^h				
Non-PAH HAPs				
Acetaldehyde^o				
Acrolein^o				
Benzene^o	2.16E-06	7.57E-04	3.51E-04	8.02E-05
1,3-Butadiene^o				
Ethylbenzene^o	1.16E-05	4.08E-03	1.89E-03	1.94E-03
Formaldehyde^o	3.66E-06	1.28E-03	5.95E-04	1.36E-04
Hexane^o	6.24E-06	2.18E-03	1.01E-03	1.04E-03
Isooctane^o	7.49E-08	2.62E-05	1.22E-05	1.25E-05
Methyl Ethyl Ketone^o	2.04E-06	7.13E-04	3.31E-04	3.40E-04
Pentane^o				
Propionaldehyde^o				
Quinone^o				
Methyl chloroform^o				
Toluene^o	8.73E-06	3.06E-03	1.42E-03	1.46E-03
Xylene^o	5.03E-05	1.76E-02	8.18E-03	8.39E-03
POM (7-PAH Group)		1.61E-04		1.71E-05
PAH HAPs^o				
2-Methylnaphthalene	8.11E-06	2.84E-03	1.32E-03	3.01E-04
3-Methylchloranthrene^o				
Acenaphthene	8.86E-07	3.10E-04	1.44E-04	3.29E-05
Acenaphthylene	9.55E-08	3.34E-05	1.55E-05	3.54E-06
Anthracene	2.39E-07	8.35E-05	3.88E-05	8.85E-06
Benzo(a)anthracene	6.48E-08	2.27E-05	1.05E-05	2.40E-06
Benzo(a)pyrene^o	7.84E-09	2.74E-06	1.27E-06	2.91E-07
Benzo(b)fluoranthene	2.59E-08	9.07E-06	4.21E-06	9.61E-07
Benzo(e)pyrene	2.66E-08	9.31E-06	4.32E-06	9.87E-07
Benzo(g,h,i)perylene	6.48E-09	2.27E-06	1.05E-06	2.40E-07
Benzo(k)fluoranthene	7.50E-09	2.63E-06	1.22E-06	2.78E-07
Chrysene	3.51E-07	1.23E-04	5.71E-05	1.30E-05
Dibenzo(a,h)anthracene	1.26E-09	4.42E-07	2.05E-07	4.68E-08
Dichlorobenzene				
Fluoranthene	1.70E-07	5.97E-05	2.77E-05	6.32E-06
Fluorene	2.63E-06	9.19E-04	4.27E-04	9.74E-05
Indeno(1,2,3-cd)pyrene	1.60E-09	5.61E-07	2.60E-07	5.94E-08
Naphthalene^o	4.26E-06	1.49E-03	6.93E-04	1.58E-04
Perylene	7.50E-08	2.63E-05	1.22E-05	2.78E-06
Phenanthrene	2.76E-06	9.67E-04	4.49E-04	1.02E-04
Pyrene	5.11E-07	1.79E-04	8.31E-05	1.90E-05
Non-HAP Organic Compounds				
Acetone^o	1.95E-06	6.81E-04	3.16E-04	3.24E-04
Benzaldehyde				
Butane				
Butyraldehyde				
Crotonaldehyde^o				
Ethylene	2.95E-05	1.03E-02	4.80E-03	4.92E-03
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				
Valeraldehyde				
Metals				
Antimony^o				
Arsenic^o				
Barium^o				
Beryllium^o				
Cadmium^o				
Chromium^o				
Cobalt^o				
Copper^o				
Hexavalent Chromium^o				
Manganese^o				
Mercury^o				
Molybdenum^o				
Nickel^o				
Phosphorus^o				
Silver^o				
Selenium^o				
Thallium^o				
Vanadium^o				
Zinc^o				

a) Emission factors are from AP-42 11.1, Hot Mix Asphalt Plants, 3/04

b) AP-42, Table 11.1-14, Predictive Emission Factor Equations for Load-Out and Silo Filling Operations, 3/04

Defaults: (-V) = 0.5 T (°F) = 325

	LOADOUT	SILO FILL
Total PM EF = 0.000181+0.00141(-V)e ^{((0.0251)(T+460)-20.43)} + 000332+ 0.00105(-V)e ^{((0.0251)(T+460)-20.43)} =	5.219E-04	5.859E-04 (split addends)
Organic PM EF = 0.00141(-V)e ^{((0.0251)(T+460)-20.43)} + 0.00105(-V)e ^{((0.0251)(T+460)-20.43)} =	3.409E-04	2.539E-04 (split addends)
TOC PM EF = 0.0172(-V)e ^{((0.0251)(T+460)-20.43)} + 0.0504(-V)e ^{((0.0251)(T+460)-20.43)} =	4.159E-03	1.219E-02 (split addends)
CO PM EF = 0.00558(-V)e ^{((0.0251)(T+460)-20.43)} + 0.00488(-V)e ^{((0.0251)(T+460)-20.43)} =	1.349E-03	1.180E-03 (split addends)

e) IDAPA Toxic Air Pollutant

f) AP-42, Table 11.1-15, Speciation Profiles for Load-out, Silo Filling, & Asphalt Storage--Organic Particulate-Based Compounds, 3/04 (EF=Spec% * Organic PM EF)

g) AP-42, Table 11.1-16, Speciation Profiles for Load-out, Silo Filling, & Asphalt Storage--Organic Volatile-Based Compounds, 3/04, (EF=Spec% * TOC PM EF)

TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Pollutants shown in blue text are organic volatile-based compounds, EF = Spec% x TOC PM EF.

G1 Electrical Generator < 600 hp (447 kW)

Fuel Type Toggle =	0
Fuel Consumption Rate	0.00 gal/hr
Calculated MMBtu/hr	0.000 MMBtu/hr
Max Daily Operation	0 hr/day
Max Annual Operation	0 hrs/yr

Rated Power (kW):

Not EPA Certified:	0
Certified EPA Tier 1:	Yes
Certified EPA Tier 2:	No
Certified EPA Tier 3:	No
Certified EPA Tier 4*:	No
Blue Sky Engine:	No

Conversion Factors:

Avg brake-specific fuel consumption (BSFC) =	7000 Btu/hp-hr	$g/kW-hr \times (lb/453g) \times (hp-hr/7000 Btu) \times (0.746 kW/hp) \times 10^6 Btu/MMBtu = lb/MMBtu$
1 hp =	0.746 kW	$g/kW-hr \times 0.23486 = lb/MMBtu$
1 lb =	453.592 g	

*Tier 4 emission factors from <https://www.epa.gov/sites/production/files/2018-02/documents/02-update-tier-4-nonroad-diesel-engines-2017-12-06.pdf> and 40 CFR 1039.101

Pollutant:	Nox	VOC (total TOC--> VOCs)	CO	PM = PM10
EMISSION FACTORS USED FOR G1 (lb/MMBtu):	4.41	0.36	0.95	0.310

AP-42, Ch 3.3 (10/96) EMISSION FACTORS (diesel fueled)

Pollutant:	Nox	VOC (total TOC--> VOCs)	CO	PM = PM10
Emission Factor (lb/MMBtu)	4.41	0.36	0.95	0.31
Emission Factor (g/kW-hr)	18.78	1.53	4.05	1.32

40 CFR 89, EPA CERTIFIED GENERATOR EMISSION FACTORS (g/kW-hr converted to lb/MMBtu)

Rated Power (kW)	Tier	Applicable?	Model Year ¹	Nox	HC	NMHC + NOx	CO	PM = PM10
kW < 8	1	0	2000	---	0.36	2.47	1.88	0.23
kW < 8	2	0	2005	---	0.36	1.76	1.88	0.09
kW < 8	4	0	2008	---	0.36	1.76	1.88	0.19
kW < 8	BlueSky	0	n/a	---	0.36	1.08	1.88	0.11
8 < kW < 19	1	0	2000	---	0.36	2.23	1.55	0.19
8 < kW < 19	2	0	2005	---	0.36	1.76	1.55	0.19
8 < kW < 19	4	0	2008	---	0.36	1.76	1.55	0.09
8 < kW < 19	BlueSky	0	n/a	---	0.36	1.06	1.55	0.11
19 < kW < 37	1	0	1999	---	0.36	2.23	1.29	0.19
19 < kW < 37	2	0	2004	---	0.36	1.76	1.29	0.14
19 < kW < 37	4	0	2008	---	0.36	1.76	1.29	0.07
19 < kW < 37	4	0	2013	---	0.36	1.10	1.29	0.01
19 < kW < 37	BlueSky	0	n/a	---	0.36	1.06	1.29	0.085
37 < kW < 56	1	0	1998	2.16	0.36	---	0.95	0.31
37 < kW < 56	2	0	2004	---	0.36	1.76	1.17	0.09
37 < kW < 56	3	0	2008	---	0.36	1.10	1.17	0.09
37 < kW < 56	4	0	2008	---	0.36	1.10	1.17	0.07
37 < kW < 56	4	0	2012	---	0.36	1.10	1.17	0.07
37 < kW < 56	4	0	2013	---	0.36	1.10	1.17	0.01
37 < kW < 56	BlueSky	0	n/a	---	0.36	1.10	1.17	0.056
56 < kW < 75	1	0	1998	2.16	0.36	---	0.95	0.31
56 < kW < 75	2	0	2004	---	0.36	1.76	1.17	0.09
56 < kW < 75	3	0	2008	---	0.36	1.10	1.17	0.09
56 < kW < 75	4	0	2012	---	0.04	0.80	1.17	0.005
56 < kW < 75	4	0	2015	0.80	0.04	---	1.17	0.005
56 < kW < 75	BlueSky	0	n/a	---	0.36	1.10	1.17	0.056
75 < kW < 130	1	0	1997	2.16	0.36	---	0.95	0.31
75 < kW < 130	2	0	2003	---	0.36	1.55	1.17	0.07
75 < kW < 130	3	0	2007	---	0.36	0.94	1.17	0.07
75 < kW < 130	4	0	2012	---	0.04	0.80	1.17	0.005
75 < kW < 130	4	0	2015	0.80	0.04	---	1.17	0.005
75 < kW < 130	BlueSky	0	n/a	---	0.36	0.94	1.17	0.042
130 < kW < 225	1	0	1996	2.16	0.31	---	2.68	0.13
130 < kW < 225	2	0	2003	---	0.31	1.55	0.82	0.05
130 < kW < 225	3	0	2006	---	0.31	0.94	0.82	0.05
130 < kW < 225	4	0	2011	0.47	0.04	---	0.82	0.005
130 < kW < 225	4	0	2014	0.47	0.04	---	0.82	0.005
130 < kW < 225	BlueSky	0	n/a	---	0.31	0.94	0.82	0.028
225 < kW < 450	1	0	1996	2.16	0.31	---	2.68	0.13
225 < kW < 450	2	0	2001	---	0.31	1.50	0.82	0.05
225 < kW < 450	3	0	2006	---	0.31	0.94	0.82	0.05
225 < kW < 450	4	0	2011	0.47	0.04	---	0.82	0.05
225 < kW < 450	4	0	2014	0.47	0.04	---	0.82	0.05

40 CFR 89, EPA CERTIFIED GENERATOR EMISSION FACTORS FOR GENERATOR G1 (lb/MMBtu)

Rated Power (kW)	Tier	Applicable?	Model Year ¹	Nox	HC	NMHC + NOx	CO	PM10
kW < 8	1	0	2000	0.00	0.00	0.00	0.00	0.00
kW < 8	2	0	2005	0.00	0.00	0.00	0.00	0.00
kW < 8	4	0	2008	0.00	0.00	0.00	0.00	0.00
kW < 8	BlueSky	0	n/a	0.00	0.00	0.00	0.00	0.00
8 < kW < 19	1	0	2000	0.00	0.00	0.00	0.00	0.00
8 < kW < 19	2	0	2005	0.00	0.00	0.00	0.00	0.00
8 < kW < 19	4	0	2008	0.00	0.00	0.00	0.00	0.00
8 < kW < 19	BlueSky	0	n/a	0.00	0.00	0.00	0.00	0.00
19 < kW < 37	1	0	1999	0.00	0.00	0.00	0.00	0.00
19 < kW < 37	2	0	2004	0.00	0.00	0.00	0.00	0.00
19 < kW < 37	4	0	2008	0.00	0.00	0.00	0.00	0.00
19 < kW < 37	4	0	2013	0.00	0.00	0.00	0.00	0.00
19 < kW < 37	BlueSky	0	n/a	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	1	0	1998	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	2	0	2004	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	3	0	2008	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	4	0	2008	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	4	0	2012	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	4	0	2013	0.00	0.00	0.00	0.00	0.00
37 < kW < 56	BlueSky	0	n/a	0.00	0.00	0.00	0.00	0.00
56 < kW < 75	1	0	1998	0.00	0.00	0.00	0.00	0.00
56 < kW < 75	2	0	2004	0.00	0.00	0.00	0.00	0.00
56 < kW < 75	3	0	2008	0.00	0.00	0.00	0.00	0.00
56 < kW < 75	4	0	2012	0.00	0.00	0.00	0.00	0.00
56 < kW < 75	4	0	2015	0.00	0.00	0.00	0.00	0.00

Facility:
7/28/2020 15:46

Knife River Corporation - Mountain West - 0053
Permit/Facility ID: P-2014.0004 777-00533

IC Engine 1 Powering an Electrical Generator < 600 hp (447 kW) AP-42 Section 3.3 (diesel fueled)

Fuel Type Toggle = 0 0 kw
 Fuel Consumption Rate 0.00 gal/hr
 Calculated MMBtu/hr 0.000 MMBtu/hr
 Max Daily Operation 0 hr/day
 Max Annual Operation 0 hrs/yr

User Input Weight % Sulfur = 0.0000%
 AP-42 3.3 SO2 EF = 0.29 for #2 fuel oil, presumed max 0.5%
 SO2 emissions are multiplied by a factor: User Input Value/0.5% = 0.00
 Not an EPA-Certified Generator

Pollutant	Emission Factor ^a (lb/MMBtu)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PM (total) ^b	0.31	0.000	0.00E+00	
PM-10 (total) ^b	0.31	0.000	0.00E+00	
PM-2.5	0.07	0.000	0.00E+00	
CO ^b	0.95	0.000	0.00E+00	
NOx ^b	4.41	0.000	0.00E+00	
SO ₂ ^b (total SOx presumed SO2)	0.29	0.00E+00	0.00E+00	
VOC ^b (total TOC--> VOCs)	0.36	0.000	0.00E+00	
Lead				
HCl ^c				
Dioxins^d				
2,3,7,8-TCDD				
Total TCDD				
1,2,3,7,8-PeCDD				
Total PeCDD				
1,2,3,4,7,8-HxCDD^e				
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD^e				
Total HxCDD				
1,2,3,4,6,7,8-Hp-CDD^e				
Total HpCDD^e				
Octa CDD^e				
Total PCDD^e				
Furans^d				
2,3,7,8-TCDF				
Total TCDF^e				
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF^e				
1,2,3,4,7,8-HxCDF				
1,2,3,6,7,8-HxCDF				
2,3,4,6,7,8-HxCDF				
1,2,3,7,8,9-HxCDF				
Total HxCDF^e				
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF^e				
Octa CDF^e				
Total PCDF^e				
Total PCDD/PCDF^e				
Non-PAH HAPs				
Acetaldehyde^e	7.67E-04	0.00E+00	0.00E+00	0.00E+00
Acrolein ^e	9.25E-05	0.00E+00	0.00E+00	0.00E+00
Benzene^{e,o}	9.33E-04	0.00E+00	0.00E+00	0.00E+00
1,3-Butadiene^{e,o}	3.91E-05	0.00E+00	0.00E+00	0.00E+00
Ethylbenzene ^e				
Formaldehyde^{e,o}	1.18E-03	0.00E+00	0.00E+00	0.00E+00
Hexane ^e				
Isooctane				
Methyl Ethyl Ketone ^e				
Pentane ^e				
Propionaldehyde ^e				
Quinone ^e				
Methyl chloroform ^e				
Toluene ^{e,o}	4.09E-04	0.00E+00	0.00E+00	0.00E+00
Xylene ^{e,o}	2.85E-04	0.00E+00	0.00E+00	0.00E+00
POM (7-PAH Group)		0.00E+00		0.00E+00

Pollutant	Emission Factor ^a (lb/MMBtu)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) Annual or 24-hr Average
PAH HAPs				
2-Methylnaphthalene				
3-Methylchloranthrene^e				
Acenaphthene^e	1.42E-06	0.00E+00	0.00E+00	0.00E+00
Acenaphthylene^e	5.06E-06	0.00E+00	0.00E+00	0.00E+00
Anthracene^e	1.87E-06	0.00E+00	0.00E+00	0.00E+00
Benzo(a)anthracene^e	1.68E-06	0.00E+00	0.00E+00	0.00E+00
Benzo(a)pyrene^{e,o}	1.88E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(b)fluoranthene^e	9.91E-08	0.00E+00	0.00E+00	0.00E+00
Benzo(e)pyrene				
Benzo(g,h,i)perylene^e	4.89E-07	0.00E+00	0.00E+00	0.00E+00
Benzo(k)fluoranthene^e	1.55E-07	0.00E+00	0.00E+00	0.00E+00
Chrysene^e	3.53E-07	0.00E+00	0.00E+00	0.00E+00
Dibenzo(a,h)anthracene^e	5.83E-07	0.00E+00	0.00E+00	0.00E+00
Dichlorobenzene				
Fluoranthene^e	7.61E-06	0.00E+00	0.00E+00	0.00E+00
Fluorene^e	2.92E-05	0.00E+00	0.00E+00	0.00E+00
Indeno(1,2,3-cd)pyrene^e	3.75E-07	0.00E+00	0.00E+00	0.00E+00
Naphthalene^{e,o}	8.48E-05	0.00E+00	0.00E+00	0.00E+00
Perylene				
Phenanthrene^e	2.94E-05	0.00E+00	0.00E+00	0.00E+00
Pyrene^e	4.78E-06	0.00E+00	0.00E+00	0.00E+00
Non-HAP Organic Compounds				
Acetone ^e				
Benzaldehyde				
Butane				
Butyraldehyde				
Crotonaldehyde ^e				
Ethylene				
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				
Valeraldehyde				
Metals				
Antimony ^e				
Arsenic^e				
Barium ^e				
Beryllium^e				
Cadmium^e				
Chromium ^e				
Cobalt ^e				
Copper ^e				
Hexavalent Chromium^e				
Manganese ^e				
Mercury ^e				
Molybdenum ^e				
Nickel^e				
Phosphorus ^e				
Silver ^e				
Selenium ^e				
Thallium ^e				
Vanadium ^e				
Zinc ^e				

- a) Emission factors are from AP-42
- b) AP-42, Table 3.3-1, Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines, 10/96
- c) AP-42, Table 3.3-2, Speciated Organic Compound Emission Factors for Uncontrolled Diesel Engine, Emission Factor Rating E, 10/96
- d) (reserved)
- e) IDAPA Toxic Air Pollutant

TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Rated Power (kW): 501

G2 Electrical Generator > 600 hp (447 kW)

Fuel Type Toggle =	1
Fuel Consumption Rate	34.33 gal/hr
Calculated MMBtu/hr	4.70 MMBtu/hr
Max Daily Operation	13 hr/day
Max Annual Operation	8,760 hrs/yr

Not EPA Certified:	No
Certified EPA Tier 1:	No
Certified EPA Tier 2:	No
Certified EPA Tier 3:	No
Certified EPA Tier 4*	No
Blue Sky Engine:	No

Conversion Factors:

Avg brake-specific fuel consumption (BSFC) =	7000	Btu/hp-hr
1 hp =	0.746	kW
1 lb =	453.592	g

$$\text{g/kW-hr} \times (\text{lb}/453\text{g}) \times (\text{hp-hr}/7000 \text{ Btu}) \times (0.746 \text{ kW}/\text{hp}) \times 10^6 \text{ Btu}/\text{MMBtu} = \text{lb}/\text{MMBtu}$$

$$\text{g/kW-hr} \times 0.23486 = \text{lb}/\text{MMBtu}$$

*Tier 4 emission factors from <https://www.epa.gov/sites/production/files/2018-02/documents/02-update-tier-4-nonroad-diesel-engines-2017-12-06.pdf> and 40 CFR 1039.101;Genset EF:

Pollutant:	NOx	VOC (total TOC--> VOCs)	CO	PM=PM10
EMISSION FACTORS USED FOR G2 (lb/MMBtu):	0.47	0.04	0.82	0.005

AP-42, Ch 3.4 (10/96) EMISSION FACTORS (diesel fueled, uncontrolled)

Pollutant:	NOx	VOC (total TOC--> VOCs)	CO	PM10
Emission Factor (lb/MMBtu)	3.2	0.09	0.85	0.13
Emission Factor (g/kW-hr)	13.63	0.38	3.62	0.55

Note: Rating for AP-42 PM10 EF of 0.0573 is "E" or Poor. Used Tier 1 PM EF and presumed PM = PM10

40 CFR 89, EPA CERTIFIED GENERATOR EMISSION FACTORS (g/kW-hr converted to lb/MMBtu)

Rated Power (kW)	Tier	Applicable?	Model Year ¹	NOx	HC	NMHC + NOx	CO	PM = PM10
130 ≤ kW ≤ 560	BlueSky	0	n/a	---	0.31	0.94	0.82	0.028
225 < kW < 450	1	0	1996	2.16	0.31	---	2.68	0.13
225 < kW < 450	2	0	2001	---	0.31	1.50	0.82	0.05
225 < kW < 450	3	0	2006	---	0.31	0.94	0.82	0.05
225 < kW < 450	4	0	2011	0.47	0.04	---	0.82	0.05
225 < kW < 450	4	0	2014	0.47	0.04	---	0.82	0.05
450 ≤ kW < 560	1	0	1996	2.16	0.31	---	2.68	0.13
450 < kW < 560	2	0	2002	---	0.31	1.50	0.82	0.05
450 < kW < 560	3	0	2006	---	0.31	0.94	0.82	0.05
450 < kW < 560	4	0	2011	0.47	0.04	---	0.82	0.005
450 ≤ kW ≤ 560	4	1	2014	0.47	0.04	---	0.82	0.005
kW > 560	1	0	2000	2.16	0.31	---	2.68	0.13
kW > 560	2	0	2006	---	0.31	1.50	0.82	0.05
kW > 560	4	0	2011	0.82	0.04	---	0.82	0.01
kW > 560*	4	0	2014	0.16	0.04	---	0.82	0.01
kW > 560	BlueSky	0	n/a	---	0.31	0.89	0.82	0.028

*Tier 4 final emission factors from 40 CFR 1039.101 for engines that are part of gensets

40 CFR 89, EPA CERTIFIED GENERATOR EMISSION FACTORS FOR GENERATOR G2 (lb/MMBtu)

Rated Power (kW)	Tier	Applicable?	Model Year ¹	NOx	HC	NMHC + NOx	CO	PM10
130 < kW < 560	BlueSky	0	n/a	0.00	0.00	0.00	0.00	0.00
225 < kW < 450	1	0	1996	0.00	0.00	0.00	0.00	0.00
225 < kW < 450	2	0	2001	0.00	0.00	0.00	0.00	0.00
225 < kW < 450	3	0	2006	0.00	0.00	0.00	0.00	0.00
225 < kW < 450	4	0	2011	0.00	0.00	0.00	0.00	0.00
225 < kW < 450	4	0	2014	0.00	0.00	0.00	0.00	0.00
450 < kW < 560	1	0	1996	0.00	0.00	0.00	0.00	0.00
450 < kW < 560	2	0	2002	0.00	0.00	0.00	0.00	0.00
450 < kW < 560	3	0	2006	0.00	0.00	0.00	0.00	0.00
450 < kW < 560	4	0	2011	0.00	0.00	0.00	0.00	0.00
450 ≤ kW ≤ 560	4	1	2014	0.47	0.04	0.00	0.82	0.00
kW > 560	1	0	2000	0.00	0.00	0.00	0.00	0.00
kW > 560	2	0	2006	0.00	0.00	0.00	0.00	0.00
kW > 560	4	0	2011	0.00	0.00	0.00	0.00	0.00
kW > 560	4	0	2015	0.00	0.00	0.00	0.00	0.00
kW > 560	BlueSky	0	n/a	0.00	0.00	0.00	0.00	0.00

EMISSION FACTORS FOR GENERATOR G2 (lb/MMBTU): 0.47 0.04 0.00 0.82 0.005

Facility:
7/28/2020 15:46

Knife River Corporation - Mountain West - 0053
Permit/Facility ID: P-2014.0004 777-00533

IC Engine 2 Powering an Electrical Generator > 600 hp (447 kW) AP-42 Section 3.4 (diesel fueled, uncontrolled)

Fuel Type Toggle = 1 501 kw User Input Weight % Sulfur = 0.5000%
 Fuel Consumption Rate 34.33 gal/hr
 Calculated MMBtu/hr 4.70 MMBtu/hr AP-42 3.4-1 SO2 EF = 1.01 x S
 Max Daily Operation 13 hr/day
 Max Annual Operation 8,760 hrs/yr
 EPA Certified Generator (Tier 1, 2, 3, or Blue Sky)

Pollutant	Emission Factor ^a (lb/MMBtu)	Emissions (lb/hr)	Emissions (T/yr)	TAPS Emissions (lb/hr) Annual or 24-hr Average
PM ^b	0.1	0.470	2.06E+00	4.70E-01
PM-10 (total) ^a	0.00	0.022	9.68E-02	2.21E-02
PM-2.5	0.0556	0.262	1.15E+00	2.62E-01
CO ^b	0.82	3.867	1.69E+01	
NOx ^b	0.47	2.210	9.68E+00	2.21E+00
SO ₂ ^b (total SOx presumed SO2)	0.505	2.376	10.405	2.38E+00
VOC ^b (total TOC--> VOCs)	0.04	0.210	0.919	
Lead				
HCl ^c				
Dioxins ^d				
2,3,7,8-TCDD				
Total TCDD				
1,2,3,7,8-PeCDD				
Total PeCDD				
1,2,3,4,7,8-HxCDD ^e				
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD ^e				
Total HxCDD				
1,2,3,4,6,7,8-Hp-CDD ^e				
Total HpCDD _e				
Octa CDD ^e				
Total PCDD ^e				
Furans ^d				
2,3,7,8-TCDF				
Total TCDF ^e				
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF ^e				
1,2,3,4,7,8-HxCDF				
1,2,3,6,7,8-HxCDF				
2,3,4,6,7,8-HxCDF				
1,2,3,7,8,9-HxCDF				
Total HxCDF ^e				
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF ^e				
Octa CDF ^e				
Total PCDF ^e				
Total PCDD/PCDF ^e				
Non-PAH HAPs				
Acetaldehyde ^c	2.52E-05	1.19E-04	5.19E-04	1.19E-04
Acrolein ^c	7.88E-06	3.71E-05	1.62E-04	2.01E-05
Benzene ^{c,e}	7.76E-04	3.65E-03	1.60E-02	3.65E-03
1,3-Butadiene ^{c,e}				
Ethylbenzene ^c				
Formaldehyde ^{c,e}	7.89E-05	3.71E-04	1.63E-03	3.71E-04
Hexane ^c				
Isooctane				
Methyl Ethyl Ketone ^c				
Pentane ^c				
Propionaldehyde ^c				
Quinone ^c				
Methyl chloroform ^c				
Toluene ^{c,e}	2.81E-04	1.32E-03	5.79E-03	7.16E-04
Xylene ^{c,e}	1.93E-04	9.08E-04	3.98E-03	4.92E-04
POM (7-PAH Group)		2.12E-05		2.12E-05

Pollutant	Emission Factor ^a (lb/MMBtu)	Emissions (lb/hr)	Emissions (T/yr)	TAPS Emissions (lb/hr) Annual or 24-hr
PAH HAPs				
2-Methylnaphthalene				
3-Methylchloranthrene ^e				
Acenaphthene ^{c1}	4.68E-06	2.20E-05	9.64E-05	2.20E-05
Acenaphthylene ^{c1}	9.23E-06	4.34E-05	1.90E-04	4.34E-05
Anthracene ^{c1}	1.23E-06	5.79E-06	2.53E-05	5.79E-06
Benzo(a)anthracene ^{c1}	6.22E-07	2.93E-06	1.28E-05	2.93E-06
Benzo(a)pyrene ^{c1,a}	2.57E-07	1.21E-06	5.30E-06	1.21E-06
Benzo(b)fluoranthene ^{c1}	1.11E-06	5.22E-06	2.29E-05	5.22E-06
Benzo(e)pyrene				
Benzo(g,h,i)perylene ^{c1}	5.56E-07	2.62E-06	1.15E-05	2.62E-06
Benzo(k)fluoranthene ^{c1}	2.18E-07	1.03E-06	4.49E-06	1.03E-06
Chrysene ^{c1}	1.53E-06	7.20E-06	3.15E-05	7.20E-06
Dibenzo(a,h)anthracene ^{c1}	3.46E-07	1.63E-06	7.13E-06	1.63E-06
Dichlorobenzene				
Fluoranthene ^{c1}	4.03E-06	1.90E-05	8.30E-05	1.90E-05
Fluorene ^{c1}	1.28E-05	6.02E-05	2.64E-04	6.02E-05
Indeno(1,2,3-cd)pyrene ^{c1}	4.14E-07	1.95E-06	8.53E-06	1.95E-06
Naphthalene ^{c1,a}	1.30E-04	6.12E-04	2.68E-03	6.12E-04
Perylene				
Phenanthrene ^{c1}	4.08E-05	1.92E-04	8.41E-04	1.92E-04
Pyrene ^{c1}	3.71E-06	1.75E-05	7.64E-05	1.75E-05
Non-HAP Organic Compounds				
Acetone ^c				
Benzaldehyde				
Butane				
Butylaldehyde				
Crotonaldehyde ^c				
Ethylene				
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				
Valeraldehyde				
Metals				
Antimony ^c				
Arsenic ^c				
Barium ^c				
Beryllium ^c				
Cadmium ^c				
Chromium ^c				
Cobalt ^c				
Copper ^c				
Hexavalent Chromium ^c				
Manganese ^c				
Mercury ^c				
Molybdenum ^c				
Nickel ^c				
Phosphorus ^c				
Silver ^c				
Selenium ^c				
Thallium ^c				
Vanadium ^c				
Zinc ^c				

- a) Emission factors are from AP-42
- b) AP-42, Table 3.4-1, Gaseous Emission Factors for Large Stationary Diesel and All Stationary Dual Fuel Engines, 10/96
- c) AP-42, Table 3.4-3, Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines, Emission Factor Rating E, 10/96
- c1) AP-42, Table 3.4-4, PAH Emission Factors for Large Uncontrolled Stationary Diesel Engines, Emission Factor Rating E, 10/96
- d) AP-42, Table 3.4-2, Particulate and Particle-Sizing Emission Factors for Large Uncontrolled Stationary Diesel Engines, Emission Factor Rating E, 10/96
- e) IDAPA Toxic Air Pollutant

TAPS lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Facility: **Knife River Corporation - Mountain West - 0053**
 7/28/2020 15:46 Permit/Facility ID: **P-2014.0004 777-00533**

Max Hourly Production 350 T/hr 96% T/hr is Aggregate & RAP = **336 T/hr**
 Max Daily Production 4,000 Tons/day 96% T/day is Aggregate & RAP = **3,840 T/day**
 Max Annual Production 325,000 Tons/yr 96% T/yr is Aggregate & RAP = **312,000 T/yr**

Fine PM emitted from RAP use is negligible (see assumptions on page 1 of this spreadsheet). Worst case emissions are for 0% RAP

Aggregate Front-end Loader Drop Points, AP-42 13.2.4 (11/06)

$E = k (0.0032) \times (U/5)^{1.3} / (M/2)^{1.4} =$ 3.31E-03 for PM 1.56E-03 lb/ton for PM10 2.37E-04 lb/ton for PM2.5

k = particle size multiplier 0.74 for PM 0.35 for PM10 0.053 for PM2.5
 U = mean wind speed = **10 mph** Wind speed range for source conditions for Equation 1: 1.3 to 15 mph. Select 10 mph as base case wind speed.
 M = moisture content = **3 %**

Moisture Content: STAPPA-ALAPCO-EPA, Emission Inventory Improvement Program, Volume II, Chapter 3, Preferred and Alternative Methods for Estimating Air Emissions from Hot Mix Asphalt Plants, Final Report, July 1996: Aggregate moisture content into dryer typically 3 to 7 %
 BAAQMD, Hot Mixing Asphalt Facilities, Engineering Evaluation Template, www.baaqmd.gov/pmt/handbook/s11c02ev.htm: Bulk aggregate moisture content typically stabilizes between 3 and 5% by weight.

Wind Category	Upper windspeed (m/sec)	Avg windspeed (m/sec)	Avg windspeed (mph)	PM10		PM2.5	
				E @ avg mph	F = Eavg mph/ E@10mph	E @ avg mph	F = Eavg mph/ E@10mph
Cat 1:	1.54	0.77	1.72	1.59E-04	0.1016	2.41E-05	0.1016
Cat 2:	3.09	2.32	5.18	6.65E-04	0.4251	1.01E-04	0.4251
Cat 3:	5.14	4.12	9.20	1.40E-03	0.8979	2.13E-04	0.8979
Cat 4:	8.23	6.69	14.95	2.64E-03	1.687	3.99E-04	1.687
Cat 5:	10.80	9.52	21.28	4.17E-03	2.670	6.32E-04	2.670
Cat 6:	14.00	12.40	27.74	5.89E-03	3.767	8.92E-04	3.767

Aggregate Front End Loader Drop Points

Drop to storage pile and drop to bins: **336 T/hr** 2 Transfer Points

Pollutant	Calculated Emission Factor from AP-42 13.2.4 (lb/ton)	Emissions Per Transfer Point				Total Emissions			
		Emissions (lb/hr) 1-hr Average	Emissions (lb/hr) 24-hr Average	Emissions (T/yr)	Emissions (lb/hr) Annual Average	Emissions (lb/hr) 1-hr Average	Emissions (lb/hr) 24-hr Average	Emissions (T/yr)	Emissions (lb/hr) Annual Average
PM (total)	3.31E-03	1.11	0.53	0.52	0.12	2.22	1.06	1.03	0.24
PM-10 (total)	1.56E-03	0.53	0.25	0.24	0.06	1.05	0.50	0.49	0.11
PM-2.5	2.37E-04	0.08	0.04	0.04	0.01	0.16	0.08	0.07	0.02

Conveyor and Scalping Screen Emission Points

Moisture/Control %:
 AP-42 Table 11.19.2-2, Note b. Moisture content of uncontrolled sources ranged from 0.21 to 1.3%
 AP-42 Table 11.19.2-2, Note b. Moisture content of controlled (water spray) sources ranged from 0.55 to 2.88% --> ~91.3% control for screening, ~95% control for conveyor transfer
 Bulk aggregate for HMA plants typically stabilizes between 3 and 5% by weight--> Apply additional **90%** control to lb/hr, etc. for the higher moisture.

Aggregate Weigh Conveyor

Transfer from bins to conveyor and from conveyor to scalping screen: **336 T/hr** 2 Transfer Points

Pollutant	Calculated Emission Factor from AP-42 13.2.4 (lb/ton)	Emissions Per Transfer Point				Total Emissions			
		Emissions (lb/hr) 1-hr Average	Emissions (lb/hr) 24-hr Average	Emissions (T/yr)	Emissions (lb/hr) Annual Average	Emissions (lb/hr) 1-hr Average	Emissions (lb/hr) 24-hr Average	Emissions (T/yr)	Emissions (lb/hr) Annual Average
PM (total)	3.31E-03	1.11E-01	5.29E-02	5.16E-02	1.18E-02	2.22E-01	1.06E-01	1.03E-01	2.35E-02
PM-10 (total)	1.56E-03	5.25E-02	2.50E-02	2.44E-02	5.57E-03	1.05E-01	5.00E-02	4.88E-02	1.11E-02
PM-2.5	2.37E-04	7.95E-03	3.79E-03	3.69E-03	8.43E-04	1.59E-02	7.58E-03	7.39E-03	1.69E-03

Aggregate Scalping Screen, AP-42 11.19 (8/04)

Aggregate flow across scalping screen onto conveyor: **336 T/hr**

Pollutant	Emission Factor Table 11.19.2-2 SCREENING UNCONTROLLED (lb/ton)	Emissions (lb/hr) 1-hr Average	Emissions (lb/hr) 24-hr Average	Emissions (T/yr)	Emissions (lb/hr) Annual Average
PM (total)	0.025	0.840	4.00E-01	3.90E-01	8.90E-02
PM-10 (total)	0.0087	0.292	1.39E-01	1.36E-01	3.10E-02
PM-2.5	1.30E-04	0.004	2.08E-03	2.03E-03	4.63E-04

Aggregate Conveyor to Drum (~top end of the drum)

Aggregate transfer from conveyor to drum dryer (1 transfer point): **336 T/hr**

Pollutant	Calculated Emission Factor from AP-42 13.2.4 (lb/ton)	Emissions Per Transfer Point			
		Emissions (lb/hr) 1-hr Average	Emissions (lb/hr) 24-hr Average	Emissions (T/yr)	Emissions (lb/hr) Annual Average
PM (total)	3.31E-03	1.11E-01	5.29E-02	5.16E-02	1.18E-02
PM-10 (total)	1.56E-03	5.25E-02	2.50E-02	2.44E-02	5.57E-03
PM-2.5	2.37E-04	7.95E-03	3.79E-03	3.69E-03	8.43E-04

Max Controlled Emissions of Any Pollutant from Drum Mix HMA Plant Fabric Filter, Tank Heater, Generator, Silo Fill/Load-out

A. Drum Mix Plant: 350 Tons/hour 929 Hours/year 325,000 Tons/year 4,000 Tons/day
 Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = Used Oil Natural Gas LPG/Propane
B. Tank Heater: 0.6000 MMBtu/hr 4,000 Hours/year 24 hrs/day
 Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected = Natural Gas
C1. IC Engine 1: 0.00 gal/hour 0 Hours/year IC Engine < 600hp #2 Fuel Oil 0 hrs/day
C2. IC Engine 2: 34.33 gal/hour 8760 Hours/year IC Engine > 600hp #2 Fuel Oil 13 hrs/day

Pollutant	A Drum Mix Max Emission Rate for Pollutant (lb/hr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (lb/hr)	C IC Engine 1 + IC Engine 2 Max Emission Rate for Pollutant (lb/hr)	D Load-out & Silo Filling Emission Rate for Pollutant (lb/hr)	E TOTAL of Max Emission Rates from A, B, C & D (lb/hr)	Pollutant	A Drum Mix Max Emission Rate for Pollutant (lb/hr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (lb/hr)	C IC Engine 1 + IC 2 Max Emission Rate for Pollutant (lb/hr)	D Load-out & Silo Filling Emission Rate for Pollutant (lb/hr)	E TOTAL of Max Emission Rates from A, B, C & D (lb/hr)
PM (total)	11.55	4.47E-03	4.81E-02	3.88E-01	11.99	PAH HAPs					
PM-10 (total)	8.05	4.47E-03	4.81E-02	3.88E-01	8.49	2-Methylnaphthalene	6.31E-03	6.45E-09		7.97E-04	7.10E-03
PM-2.5	7.81	4.47E-03	4.81E-02	3.88E-01	8.25	3-Methylchloranthrene ^e	0.00E+00	4.83E-10			4.83E-10
CO	45.50	4.94E-02	0.00E+00	8.85E-01	46.43	Acenaphthene	5.19E-05	4.83E-10	4.40E-05	7.72E-05	1.73E-04
NOx	19.25	5.88E-02	1.12E+00		20.43	Acenaphthylene	8.16E-04	4.83E-10	8.68E-05	4.86E-06	9.08E-04
SO ₂	6.23	3.53E-04	4.75E+00		10.98	Anthracene	1.15E-04	6.45E-10	1.16E-05	2.11E-05	1.48E-04
VOC	11.20	3.24E-03	6.17E-02	1.41E+00	12.68	Benzo(a)anthracene ^e	7.79E-06	4.83E-10	5.85E-06	7.68E-06	2.13E-05
Lead	5.25E-03	2.94E-07	0.00E+00		5.25E-03	Benzo(a)pyrene ^e	3.64E-07	3.22E-10	2.42E-06	2.91E-07	3.07E-06
HCl ^e	7.35E-02	0.00E+00	0.00E+00		7.35E-02	Benzo(b)fluoranthene ^e	3.71E-06	4.83E-10	1.04E-05	9.61E-07	1.51E-05
Dioxins ^e						Benzo(e)pyrene	4.08E-06	0.00E+00		1.88E-06	5.96E-06
2,3,7,8-TCDD	7.79E-12				7.79E-12	Benzo(g,h,i)perylene	1.48E-06	3.22E-10	5.23E-06	2.40E-07	6.96E-06
Total TCDD	3.45E-11				3.45E-11	Benzo(k)fluoranthene ^e	1.52E-06	4.83E-10	2.05E-06	2.78E-07	3.85E-06
1,2,3,7,8-PeCDD	1.15E-11				1.15E-11	Chrysene ^e	6.68E-06	4.83E-10	1.44E-05	3.28E-05	5.39E-05
Total PeCDD	8.16E-10				8.16E-10	Dibenzo(a,h)anthracene ^e	0.00E+00	3.22E-10	3.26E-06	4.68E-08	3.30E-06
1,2,3,4,7,8-HxCDD	1.56E-11	0.00E+00			1.56E-11	Dichlorobenzene	0.00E+00	3.22E-07			3.22E-07
1,2,3,6,7,8-HxCDD	4.82E-11				4.82E-11	Fluoranthene	2.26E-05	8.06E-10	3.79E-05	2.05E-05	8.10E-05
1,2,3,7,8,9-HxCDD	3.64E-11	0.00E+00			3.64E-11	Fluorene	4.08E-04	7.52E-10	1.20E-04	1.93E-04	7.21E-04
Total HxCDD	4.45E-10				4.45E-10	Indeno(1,2,3-cd)pyrene ^e	2.60E-07	4.83E-10	3.89E-06	5.94E-08	4.21E-06
1,2,3,4,6,7,8-HpCDD	1.78E-10	0.00E+00			1.78E-10	Naphthalene ^e	2.41E-02	1.64E-07	1.22E-03	3.30E-04	2.57E-02
Total HpCDD	7.05E-10	0.00E+00			7.05E-10	Perylene	3.26E-07	0.00E+00		5.61E-06	5.94E-06
Octa CDD	9.28E-10	0.00E+00			9.28E-10	Phenanthrene	8.53E-04	4.57E-09	3.84E-04	2.72E-04	1.51E-03
Total PCDD ^h	2.93E-09	0.00E+00			2.93E-09	Pyrene	1.11E-04	1.34E-09	3.49E-05	6.04E-05	2.07E-04
Furans ^e						Non-HAP Organic Compounds					
2,3,7,8-TCDF	3.60E-11				3.60E-11	Acetone ^e	1.38E-01	0.00E+00		1.44E-03	1.40E-01
Total TCDF	1.37E-10	0.00E+00			1.37E-10	Benzaldehyde	1.83E-02	0.00E+00			1.83E-02
1,2,3,7,8-PeCDF	1.60E-10				1.60E-10	Butane	1.12E-01	1.24E-03			1.13E-01
2,3,4,7,8-PeCDF	3.12E-11				3.12E-11	Butyraldehyde	2.67E-02	0.00E+00			2.67E-02
Total PeCDF	3.12E-09	0.00E+00			3.12E-09	Crotonaldehyde ^e	1.43E-02	0.00E+00			1.43E-02
1,2,3,4,7,8-HxCDF	1.48E-10				1.48E-10	Ethylene	1.17E+00	0.00E+00		2.73E-02	1.19E+00
1,2,3,6,7,8-HxCDF	4.45E-11				4.45E-11	Heptane	1.57E+00	0.00E+00			1.57E+00
2,3,4,6,7,8-HxCDF	7.05E-11				7.05E-11	Hexanal	1.83E-02	0.00E+00			1.83E-02
1,2,3,7,8,9-HxCDF	3.12E-10				3.12E-10	Isovaleraldehyde	5.33E-03	0.00E+00			5.33E-03
Total HxCDF	4.82E-10	0.00E+00			4.82E-10	2-Methyl-1-pentene	6.67E-01	0.00E+00			6.67E-01
1,2,3,4,6,7,8-HpCDF	2.41E-10				2.41E-10	2-Methyl-2-butene	9.67E-02	0.00E+00			9.67E-02
1,2,3,4,7,8,9-HpCDF	1.00E-10				1.00E-10	3-Methylpentane	3.17E-02	0.00E+00			3.17E-02
Total HpCDF	3.71E-10	0.00E+00			3.71E-10	1-Pentene	3.67E-01	0.00E+00			3.67E-01
Octa CDF	1.78E-10	0.00E+00			1.78E-10	n-Pentane	3.50E-02	0.00E+00			3.50E-02
Total PCDF ^h	1.48E-09	0.00E+00			1.48E-09	Valeraldehyde ^e	1.12E-02	0.00E+00			1.12E-02
Total PCDD/PCDF ^h	4.45E-09	0.00E+00	0.00E+00		4.45E-09	Metals					
Non-PAH HAPs						Antimony ^e	3.00E-05	0.00E+00			3.00E-05
Acetaldehyde ^e	4.82E-02		2.37E-04		4.85E-02	Arsenic ^e	2.08E-05	5.37E-08			2.08E-05
Acrolein ^e	4.33E-03		4.02E-05		4.37E-03	Barium ^e	9.67E-04	2.59E-06			9.69E-04
Benzene ^e	1.45E-02	5.64E-07	7.30E-03	2.25E-04	2.20E-02	Beryllium ^e	0.00E+00	3.22E-09			3.22E-09
1,3-Butadiene ^e			0.00E+00		0.00E+00	Cadmium ^e	1.52E-05	2.95E-07			1.55E-05
Ethylbenzene ^e	4.00E-02			2.71E-03	4.27E-02	Chromium ^e	9.17E-04	8.24E-07			9.17E-04
Formaldehyde ^e	1.15E-01	2.01E-05	7.42E-04	3.26E-03	1.19E-01	Cobalt ^e	4.33E-06	4.94E-08			4.38E-06
Hexane ^e	1.53E-01	1.06E-03		3.07E-03	1.57E-01	Copper ^e	5.17E-04	5.00E-07			5.17E-04
Isocane ^e	6.67E-03			1.88E-05	6.69E-03	Hexavalent Chromium ^e	1.67E-05	0.00E+00			1.67E-05
Methyl Ethyl Ketone ^e	3.33E-03			1.13E-03	4.47E-03	Manganese ^e	1.28E-03	0.00E+00			1.28E-03
Pentane ^e		1.53E-03			1.53E-03	Mercury ^e	4.33E-04	0.00E+00			4.33E-04
Propionaldehyde ^e	2.17E-02				2.17E-02	Molybdenum ^e	0.00E+00	6.47E-07			6.47E-07
Quinone ^e	2.67E-02				2.67E-02	Nickel ^e	2.34E-03	0.00E+00			2.34E-03
Methyl chloroform ^e	8.00E-03				8.00E-03	Phosphorus ^e	4.67E-03	0.00E+00			4.67E-03
Toluene ^e	4.83E-01	2.00E-06	1.43E-03	2.71E-03	4.87E-01	Silver ^e	8.00E-05	0.00E+00			8.00E-05
Xylene ^e	3.33E-02		9.84E-04	1.36E-02	4.79E-02	Selenium ^e	5.83E-05	0.00E+00			5.83E-05
POM (7-PAH Group) ^e	2.03E-05	3.06E-09	4.23E-05	4.21E-05	1.05E-04	Thallium ^e	6.83E-07	0.00E+00			6.83E-07
TOTAL PAH HAPs	3.28E-02	5.06E-07	1.99E-03	1.83E-03	3.66E-02	Vanadium ^e	0.00E+00	1.35E-06			1.35E-06
						Zinc ^e	1.02E-02	0.00E+00			1.02E-02

e) IDAPA Toxic Air Pollutant

Criteria Pollutant lb/hr emissions are maximum 1-hr averages
 TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.
 Pollutants shown in blue text are emitted only when burning Used Oil, but not when burning #2 Fuel Oil or Natural Gas

Facility:
7/28/2020 15:46

Knife River Corporation - Mountain West - 0053
Permit/Facility ID: P-2014.0004 777-00533

EMISSION INVENTORY

POUNDS PER HOUR

Page 2 of 2

Max Controlled Emissions of Any Pollutant from Drum Mix HMA Plant Fabric Filter, Tank Heater, Generator, Silo Fill/Load-out

A. Drum Mix Plant: 350 Tons/hour 929 Hours/year 325,000 Tons/year HMA throughput 4,000 hrs/day
 Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = Used Oil Natural Gas LPG/Propane
B. Tank Heater: 0.6000 MMBtu/hr 4,000 Hours/year 24 hrs/day
 Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = Natural Gas
C1. IC Engine 1: 0.00 gal/hour 0 Hours/year #2 Fuel Oil Generator < 600hp 0 hrs/day
C2. IC Engine 2: 34.33 gal/hour 8760 Hours/year #2 Fuel Oil Generator > 600hp 13 hrs/day

Pollutant	A Drum Mix Max Emission Rate for Pollutant (lb/hr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (lb/hr)	C IC Engine Max Emission Rate for Pollutant (lb/hr)	D Load-out & Silo Filling Emission Rate for Pollutant (lb/hr)	E TOTAL of Max Emission Rates from A, B, C & D (lb/hr)
non-PAH HAPs^e					
Bromomethane ^e				1.66E-04	1.66E-04
2-Butanone (see Methyl Ethyl Ketone)					
Carbon disulfide ^e				4.15E-04	4.15E-04
Chloroethane (Ethyl chloride ^e)				8.27E-05	8.27E-05
Chloromethane (Methyl chloride ^e)				5.71E-04	5.71E-04
Cumene				7.62E-04	7.62E-04
n-Hexane					
Methylene chloride (Dichloromethane ^e)				5.48E-06	5.48E-06
MTBE					
Styrene ^e				1.60E-04	1.60E-04
Tetrachloroethene (Tetrachloroethylene ^e)				5.34E-05	5.34E-05
1,1,1-Trichloroethane (Methyl chloroform ^e)					
Trichloroethene (Trichloroethylene ^e)					
Trichlorofluoromethane				9.01E-06	9.01E-06
m-p-Xylene ^e				6.90E-03	6.90E-03
o-Xylene ^e				6.70E-03	6.70E-03
Phenol ^{e,f}				6.71E-04	6.71E-04
Non-HAP Organic Compounds					
Methane				5.73E-01	5.73E-01

e) IDAPA Toxic Air Pollutant

4.02E-01

TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Max Controlled Emissions of Any Pollutant from Drum Mix HMA Plant Fabric Filter, Tank Heater, Generator, Silo Fill/Load-out

A. Drum Mix Plant: 350 Tons/hour 929 Hours/year 325,000 Tons/year HMA throughput 4,000 hrs/day
 Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = Used Oil Natural Gas LPG/Propane
B. Tank Heater: 0.6000 MMBtu/hr 4,000 Hours/year
 Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected = 24 hrs/day Natural Gas
C1. IC Engine 1: 0.00 gal/hour 0 Hours/year IC Engine <600hp #2 Fuel Oil 0 hrs/day
C2. IC Engine 2: 34.33 gal/hour 8760 Hours/year IC Engine > 600hp #2 Fuel Oil 13 hrs/day

Pollutant	A Drum Mix Max Emission Rate for Pollutant (T/yr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (T/yr)	C IC Engine IC1 + IC2 Max Emission Rate for Pollutant (T/yr)	D Load-out & Silo Filling Emission Rate for Pollutant (T/yr)	E POINT SOURCE TOTAL of Max Emission Rates from A, B, & C (T/yr) Exclude Fugitives (D)
PM (total)	5.36	8.94E-03	2.11E-01	1.80E-01	5.58
PM-10 (total)	3.74	8.94E-03	2.11E-01	1.80E-01	3.96
PM-2.5	3.62	8.94E-03	2.11E-01	1.80E-01	3.84
CO	21.13	9.88E-02	0.00E+00	4.11E-01	21.22
NOx	8.94	1.18E-01	4.91E+00		13.96
SO ₂	2.89	7.06E-04	2.08E+01		23.70
VOC	5.20	6.47E-03	2.70E-01	6.55E-01	5.48
Lead	2.44E-03	5.88E-07	0.00E+00		2.44E-03
HCl ^o	3.41E-02	0.00E+00	0.00E+00		3.41E-02
Dioxins^o					
2,3,7,8-TCDD	3.41E-11				3.41E-11
Total TCDD	1.51E-10				1.51E-10
1,2,3,7,8-PeCDD	5.04E-11				5.04E-11
Total PeCDD	3.58E-09				3.58E-09
1,2,3,4,7,8-HxCDD	6.83E-11	0.00E+00			6.83E-11
1,2,3,6,7,8-HxCDD	2.11E-10				2.11E-10
1,2,3,7,8,9-HxCDD	1.59E-10	0.00E+00			1.59E-10
Total HxCDD	1.95E-09				1.95E-09
1,2,3,4,6,7,8-HpCDD	7.80E-10	0.00E+00			7.80E-10
Total HpCDD	3.09E-09	0.00E+00			3.09E-09
Octa CDD	4.06E-09	0.00E+00			4.06E-09
Total PCDD ^o	1.28E-08	0.00E+00			1.28E-08
Furans^o					
2,3,7,8-TCDF	1.58E-10				1.58E-10
Total TCDF	6.01E-10	0.00E+00			6.01E-10
1,2,3,7,8-PeCDF	6.99E-10				6.99E-10
2,3,4,7,8-PeCDF	1.37E-10				1.37E-10
Total PeCDF	1.37E-08	0.00E+00			1.37E-08
1,2,3,4,7,8-HxCDF	6.50E-10				6.50E-10
1,2,3,6,7,8-HxCDF	1.95E-10				1.95E-10
2,3,4,6,7,8-HxCDF	3.09E-10				3.09E-10
1,2,3,7,8,9-HxCDF	1.37E-09				1.37E-09
Total HxCDF	2.11E-09	0.00E+00			2.11E-09
1,2,3,4,6,7,8-HpCDF	1.06E-09				1.06E-09
1,2,3,4,7,8,9-HpCDF	4.39E-10				4.39E-10
Total HpCDF	1.63E-09	0.00E+00			1.63E-09
Octa CDF	7.80E-10	0.00E+00			7.80E-10
Total PCDF ^o	6.50E-09	0.00E+00			6.50E-09
Total PCDD/PCDF ^o	1.95E-08	0.00E+00			1.95E-08
Non-PAH HAPs					
Acetaldehyde ^o	2.11E-01		1.04E-03		2.12E-01
Acrolein ^o	4.23E-03		3.25E-04		4.55E-03
Benzene ^o	6.34E-02	2.47E-06	3.20E-02	9.85E-04	9.54E-02
1,3-Butadiene ^o	0.00E+00		0.00E+00		0.00E+00
Ethylbenzene ^o	3.90E-02		2.64E-03		3.90E-02
Formaldehyde ^o	5.04E-01	8.82E-05	3.25E-03	1.43E-02	5.07E-01
Hexane ^o	1.50E-01	2.12E-03		2.99E-03	1.52E-01
Isooctane ^o	6.50E-03		1.83E-05		6.50E-03
Methyl Ethyl Ketone ^o	3.25E-03		1.10E-03		3.25E-03
Pentane ^o	0.00E+00	3.06E-03			3.06E-03
Propionaldehyde ^o	2.11E-02				2.11E-02
Quinone ^o	2.60E-02				2.60E-02
Methyl chloroform ^o	7.80E-03				7.80E-03
Toluene ^o	4.71E-01	4.00E-06	1.16E-02	2.65E-03	4.83E-01
Xylene ^o	3.25E-02	0.00E+00	7.95E-03	1.33E-02	4.05E-02
TOTAL Federal HAPs (T/yr)=					1.82E+00

Pollutant	A Drum Mix Max Emission Rate for Pollutant (T/yr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (T/yr)	C IC Engine IC1 + IC2 Max Emission Rate for Pollutant (T/yr)	D Load-out & Silo Filling Emission Rate for Pollutant (T/yr)	E POINT SOURCE TOTAL of Max Emission Rates from A, B, & C (T/yr) Exclude Fugitives (D)
PAH HAPs					
2-Methylnaphthalene	2.76E-02	2.82E-08		3.49E-03	2.76E-02
3-Methylchloranthrene ^o	0.00E+00	2.12E-09			2.12E-09
Acenaphthene	2.28E-04	2.12E-09	1.93E-04	3.38E-04	4.20E-04
Acenaphthylene	3.58E-03	2.12E-09	3.80E-04	2.13E-05	3.96E-03
Anthracene	5.04E-04	2.82E-09	5.07E-05	9.24E-05	5.54E-04
Benzo(a)anthracene ^o	3.41E-05	2.12E-09	2.56E-05	3.36E-05	5.98E-05
Benzo(a)pyrene ^o	1.59E-06	1.41E-09	1.06E-05	1.27E-06	1.22E-05
Benzo(b)fluoranthene ^o	1.63E-05	2.12E-09	4.57E-05	4.21E-06	6.20E-05
Benzo(e)pyrene	1.79E-05	0.00E+00		8.24E-06	1.79E-05
Benzo(g,h,i)perylene	6.50E-06	1.41E-09	2.29E-05	1.05E-06	2.94E-05
Benzo(k)fluoranthene ^o	6.66E-06	2.12E-09	8.98E-06	1.22E-06	1.56E-05
Chrysene ^o	2.93E-05	2.12E-09	6.30E-05	1.44E-04	9.23E-05
Dibenzo(a,h)anthracene ^o	0.00E+00	1.41E-09	1.43E-05	2.05E-07	1.43E-05
Dichlorobenzene	0.00E+00	1.41E-06			1.41E-06
Fluoranthene	9.91E-05	3.53E-09	1.66E-04	8.96E-05	2.65E-04
Fluorene	1.79E-03	3.29E-09	5.27E-04	8.43E-04	2.31E-03
Indeno(1,2,3-cd)pyrene ^o	1.14E-06	2.12E-09	1.71E-05	2.60E-07	1.82E-05
Naphthalene ^o	1.06E-01	7.18E-07	5.36E-03	1.44E-03	1.11E-01
Perylene	1.43E-06	0.00E+00		2.46E-05	1.43E-06
Phenanthrene	3.74E-03	2.00E-08	1.68E-03	1.19E-03	5.42E-03
Pyrene	4.88E-04	5.88E-09	1.53E-04	2.65E-04	6.40E-04
Non-HAP Organic Compounds					
Acetone ^o	1.35E-01	0.00E+00		1.41E-03	1.35E-01
Benzaldehyde	1.79E-02	0.00E+00			1.79E-02
Butane	1.09E-01	2.47E-03			1.11E-01
Butyraldehyde	2.60E-02	0.00E+00			2.60E-02
Crotonaldehyde ^o	1.40E-02	0.00E+00			1.40E-02
Ethylene	1.14E+00	0.00E+00		2.66E-02	1.14E+00
Heptane	1.53E+00	0.00E+00			1.53E+00
Hexanal	1.79E-02	0.00E+00			1.79E-02
Isovaleraldehyde	5.20E-03	0.00E+00			5.20E-03
2-Methyl-1-pentene	6.50E-01	0.00E+00			6.50E-01
2-Methyl-2-butene	9.43E-02	0.00E+00			9.43E-02
3-Methylpentane	3.09E-02	0.00E+00			3.09E-02
1-Pentene	3.58E-01	0.00E+00			3.58E-01
n-Pentane ^o	3.41E-02	0.00E+00			3.41E-02
Valeraldehyde ^o	1.09E-02	0.00E+00			1.09E-02
Metals					
Antimony ^o	2.93E-05	0.00E+00			2.93E-05
Arsenic ^o	9.10E-05	2.35E-07			9.12E-05
Barium ^o	9.43E-04	5.18E-06			9.48E-04
Beryllium ^o	0.00E+00	1.41E-08			1.41E-08
Cadmium ^o	6.66E-05	1.29E-06			6.79E-05
Chromium ^o	8.94E-04	1.65E-06			8.95E-04
Cobalt ^o	4.23E-06	9.88E-08			4.32E-06
Copper ^o	5.04E-04	1.00E-06			5.05E-04
Hexavalent Chromium ^o	7.31E-05	0.00E+00			7.31E-05
Manganese ^o	1.25E-03	0.00E+00			1.25E-03
Mercury ^o	4.23E-04	0.00E+00			4.23E-04
Molybdenum ^o	0.00E+00	1.29E-06			1.29E-06
Nickel ^o	1.02E-02	0.00E+00			1.02E-02
Phosphorus ^o	4.55E-03	0.00E+00			4.55E-03
Silver ^o	7.80E-05	0.00E+00			7.80E-05
Selenium ^o	5.69E-05	0.00E+00			5.69E-05
Thallium ^o	6.66E-07				6.66E-07
Vanadium ^o	0.00E+00	2.71E-06			2.71E-06
Zinc ^o	9.91E-03	0.00E+00			9.91E-03

Facility: Knife River Corporation - Mountain West - 0053

7/28/2020 15:46

Permit/Facility ID:

P-2014.0004

777-00533

CRITERIA POLLUTANT MODELING

POUNDS PER HOUR - POINT AND PSEUDO-STACK SOURCES

Maximum Controlled Emissions of Any Pollutant from Drum Mix HMA Plant with Fabric Filter, Tank Heater, Generator, Silo Fill/Load-out

A. Drum Mix Plant: 350 Tons/hour 929 Hours/year 325,000 Tons/year
 Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected =
B. Tank Heater: 0.6000 MMBtu Rate 4,000 Hours/year
 Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected =
C1. IC Engine 1: 0.00 gal/hour 0 Hours/year IC Engine < 600hp
C2. IC Engine 2: 34.33 gal/hour 8760 Hours/year IC Engine > 600hp

4,000 Tons/day	11.4 hr/day	929 hr/yr
0.0015% S	Used Oil	Natural Gas
0.0000% S	0.1000% S	LPG/Propane
0.5000% S	#2 Fuel Oil	24 hrs/day
		Natural Gas
		0 hrs/day
		13 hrs/day

Max 1-hour, 3-hour, and 8-hour averages

Pollutant	A Drum Mix Max Emission Rate for Pollutant (lb/hr)	B Asphaltic Oil Tank Heater Max Emission Rate for Pollutant (lb/hr)	C1 IC1 < 600 bhp Generator Max Emission Rate for Pollutant (lb/hr)	C2 IC2 > 600 bhp Generator Max Emission Rate for Pollutant (lb/hr)	D1 Silo Filling Emission Rate for Pollutant (lb/hr)	D2 Load-out Emission Rate for Pollutant (lb/hr)	See Scalping Scrn & Transfer Points" worksheet for 1-hour, 24-hour, and annual PM10 emission rates from those sources.
PM (total)							
PM-10 (total)	8.05	4.47E-03	0.00E+00	2.21E-02	2.05E-01	1.83E-01	
PM-2.5	7.81	4.47E-03	0.00E+00	2.62E-01	2.05E-01	1.83E-01	
CO	45.50	4.94E-02	0.00E+00	3.87E+00	4.13E-01	4.72E-01	
NOx	19.25	5.88E-02	0.00E+00	2.21E+00			
SO ₂	6.23	3.53E-04	0.00E+00	2.38E+00			
VOC	11.20	3.24E-03	0.00E+00	2.10E-01	4.27E-02	1.37E+00	
Lead	5.25E-03	2.94E-07					

Max 24-hour averages

Pollutant	A Drum Mix Max Emission Rate for Pollutant (lb/hr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (lb/hr)	C1 G1 < 600 hp Generator Max Emission Rate for Pollutant (lb/hr)	C2 G2 > 600hp Generator Max Emission Rate for Pollutant (lb/hr)	D1 Silo Filling Emission Rate for Pollutant (lb/hr)	D2 Load-out Emission Rate for Pollutant (lb/hr)	See Scalping Scrn & Transfer Points" worksheet for 1-hour, 24-hour, and annual PM10 emission rates from those sources.
PM (total)							
PM-10 (total)	3.83	4.47E-03	0.00E+00	1.20E-02	9.76E-02	8.70E-02	
PM-2.5	3.72	4.47E-03	0.00E+00	0.1416688	9.76E-02	8.70E-02	
CO							
NOx							
SO ₂	2.97	3.53E-04	0.00E+00	1.29E+00			
VOC							
Lead							

Max Annual averages

Pollutant	A Drum Mix Max Emission Rate for Pollutant (lb/hr)	B Asphalt Tank Heater Max Emission Rate for Pollutant (lb/hr)	C1 G1 < 600 hp Generator Max Emission Rate for Pollutant (lb/hr)	C2 G2 > 600hp Generator Max Emission Rate for Pollutant (lb/hr)	D1 Silo Filling Emission Rate for Pollutant (lb/hr)	D2 Load-out Emission Rate for Pollutant (lb/hr)	See Scalping Scrn & Transfer Points" worksheet for 1-hour, 24-hour, and annual PM10 emission rates from those sources.
PM (total)							
PM-10 (total)	0.85	2.04E-03	0.00E+00	2.21E-02	2.17E-02	1.94E-02	
PM-2.5	0.83	2.04E-03					
CO							
NOx	2.04	2.69E-02	0.00	2.21			
SO ₂	0.66	0.00	0.00E+00	2.38			
VOC							
Lead							

Max Emissions of Any Pollutant from Drum Mix HMA Plant Fabric Filter, Tank Heater, Silo Fill/Load-out - Generator not included

A. Drum Mix Plant: 350 Tons/hour 929 Hours/year 325,000 Tons/year 4,000 Tons/day
 Maximum emission for each pollutant from any fuel-burning option selected on "Facility Data" worksheet

B. Tank Heater: 0.6000 MMBtu Rated 4,000 Hours/year
 Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet

D. Include all emissions from Load-out/Silo Filling? Yes

Short Term Source Factor 586 ELs? 1

C1. IC Engine G1: 0.00 gal/hour 0 Hours/year
C2. IC Engine G2: 34.33 gal/hour 8760 Hours/year

IC Engine <600hp #2 Fuel Oil 0 hrs/day
 IC Engine >600hp #2 Fuel Oil 13 hrs/day

Pollutant	TOTAL of Max Emission Rates from A, B, & D (lb/hr)	TAPs Screening Emission Limit (EL) Increment ^b (lb/hr)	TAPs Emissions Exceeds EL Increment?	Modeled? Meets AAC or AACC?
HCl ^e	0.074	0.05	Exceeds	
Dioxins		Toxic Equivalency Factor ^c	Adjusted Emission Rate (lb/hr)	
2,3,7,8-TCDD	7.79E-12	1.0	7.79E-12	
Total TCDD	3.45E-11	n/a		
1,2,3,7,8-PeCDD	1.15E-11	1.0	1.15E-11	
Total PeCDD	8.16E-10	n/a		
1,2,3,4,7,8-HxCDD	1.56E-11	0.1	1.56E-12	
1,2,3,6,7,8-HxCDD	4.82E-11	0.1	4.82E-12	
1,2,3,7,8,9-HxCDD	3.64E-11	0.1	3.64E-12	
Total HxCDD	4.45E-10	n/a		
1,2,3,4,6,7,8-HpCDD	1.78E-10	0.01	1.78E-12	
Total HpCDD	7.05E-10	n/a		
Octa CDD	9.28E-10	0.0003	2.78E-13	
Total PCDD	2.93E-09	n/a		
Furans				
2,3,7,8-TCDF	3.60E-11	0.1	3.60E-12	
Total TCDF	1.37E-10	n/a		
1,2,3,7,8-PeCDF	1.60E-10	0.03	4.79E-12	
2,3,4,7,8-PeCDF	3.12E-11	0.3	9.35E-12	
Total PeCDF	3.12E-09	n/a		
1,2,3,4,7,8-HxCDF	1.48E-10	0.1	1.48E-11	
1,2,3,6,7,8-HxCDF	4.45E-11	0.1	4.45E-12	
2,3,4,6,7,8-HxCDF	7.05E-11	0.1	7.05E-12	
1,2,3,7,8,9-HxCDF	3.12E-10	0.1	3.12E-11	
Total HxCDF	4.82E-10	n/a		
1,2,3,4,6,7,8-HpCDF	2.41E-10	0.01	2.41E-12	
1,2,3,4,7,8,9-HpCDF	1.00E-10	0.01	1.00E-12	
Total HpCDF	3.71E-10	n/a		
Octa CDF	1.78E-10	0.0003	5.34E-14	
Total PCDF	1.48E-09	n/a		
Total PCDD/PCDF	4.45E-09	n/a		
TOTAL Dioxin/Furans ^c	1.10E-10	1.50E-10	No	Modeled?
Non-PAH HAPs				
Acetaldehyde	4.82E-02	3.00E-03	Exceeds	
Acrolein	4.33E-03	0.017	No	
Benzene	1.47E-02	8.00E-04	Exceeds	
1,3-Butadiene				
Ethylbenzene	4.27E-02	29	No	
Formaldehyde	1.18E-01	5.10E-04	Exceeds	
Hexane	1.57E-01	12	No	
Isocotane	6.69E-03			
Methyl Ethyl Ketone	4.47E-03	39.3	No	
Pentane	1.53E-03	118	No	
Propionaldehyde	2.17E-02	0.0287	No	
Quinone	2.67E-02	0.027	No	
Methyl chloroform	8.00E-03	127	No	
Toluene	4.86E-01	25	No	
Xylene	4.69E-02	29	No	

Pollutant	TOTAL of Max Emission Rates from A, B, & D (lb/hr)	TAPs Screening Emission Limit (EL) Increment ^b (lb/hr)	TAPs Emissions Exceeds EL Increment?	Modeled? Meets AAC or AACC?
PAH HAPs				
2-Methylnaphthalene	7.10E-03	9.10E-05	Exceeds	
3-Methylchloranthrene	4.83E-10	2.50E-06	No	
Acenaphthene	1.29E-04	9.10E-05	Exceeds	
Acenaphthylene	8.21E-04	9.10E-05	Exceeds	
Anthracene	1.36E-04	9.10E-05	Exceeds	
Benzo(a)anthracene	1.55E-05			see POM
Benzo(a)pyrene	6.55E-07	2.00E-06	No	see POM
Benzo(b)fluoranthene	4.67E-06			see POM
Benzo(e)pyrene	5.96E-06	9.10E-05	No	
Benzo(g,h,i)perylene	1.72E-06	9.10E-05	No	
Benzo(k)fluoranthene	1.80E-06			see POM
Chrysene	3.95E-05			see POM
Dibenzo(a,h)anthracene	4.71E-08			see POM
Dichlorobenzene	3.22E-07	9.10E-05	No	
Fluoranthene	4.31E-05	9.10E-05	No	
Fluorene	6.01E-04	9.10E-05	Exceeds	
Indeno(1,2,3-cd)pyrene	3.20E-07			see POM
Naphthalene ^e	2.44E-02	9.10E-05	Exceeds	
Perylene	5.94E-06	9.10E-05	No	
Phenanthrene	1.13E-03	9.10E-05	Exceeds	
Pyrene	1.72E-04	9.10E-05	Exceeds	
PolycyclicOrganicMatter ^d	6.25E-05	2.00E-06	Exceeds	
Non-HAP Organic Compounds				
Acetone	1.40E-01	119	No	
Benzaldehyde	1.83E-02			
Butane	1.13E-01			
Butyraldehyde	2.67E-02			
Crotonaldehyde	1.43E-02	0.38	No	
Ethylene	1.19E+00			
Heptane	1.57E+00	109	No	
Hexanal	1.83E-02			
Isovaleraldehyde	5.33E-03			
2-Methyl-1-pentene	6.67E-01			
2-Methyl-2-butene	9.67E-02			
3-Methylpentane	3.17E-02			
1-Pentene	3.67E-01			
n-Pentane ^e	3.50E-02	118	No	
Valeraldehyde (n-Valeraldehyde)	1.12E-02	11.7	No	
Metals				
Antimony ^f	3.00E-05	0.033	No	
Arsenic	2.08E-05	1.50E-06	Exceeds	
Barium	9.69E-04	0.033	No	
Beryllium	3.22E-09	2.80E-05	No	
Cadmium	1.55E-05	3.70E-06	Exceeds	
Chromium	9.17E-04	0.033	No	
Cobalt	4.38E-06	0.0033	No	
Copper	5.17E-04	0.013	No	
Hexavalent Chromium	1.67E-05	5.60E-07	Exceeds	
Manganese	1.28E-03	0.067	No	
Mercury	4.33E-04	0.003	No	
Molybdenum	6.47E-07	0.333	No	
Nickel	2.34E-03	2.70E-05	Exceeds	
Phosphorus	4.67E-03	0.007	No	
Silver	8.00E-05	0.007	No	
Selenium	5.83E-05	0.013	No	
Thallium	6.83E-07	0.007	No	
Vanadium	1.35E-06	0.003	No	
Zinc	1.02E-02	0.667	No	

a) Reserved.

b) Toxic Air Pollutants, IDAPA 58.01.01.585 and .586, levels in effect as of February 25, 2009

c) 2005, Van den Berg, et al, The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds, *Toxicological Sciences* 93(2), 223-241 (2006). Accessible at <http://toxsci.oxfordjournals.org/cgi/reprint/93/2/223>.

Use of the 2005 WHO toxic equivalency factors (TEFs) is consistent with current EPA recommendations for TRI reporting (72 FR 26544, May 10, 2007)

n/a = not available. IDAPA 58.01.01.586, TAPs Carcinogenic Increments: Total of adjusted emission rates are treated as a single TAP (2,3,7,8 TCDD)

d) IDAPA 58.01.01.586, Polycyclic Organic Matter: Emissions of highlighted PAHs shall be considered together as one TAP equivalent in potency to benzo(a)pyrene.

e) Naphthalene is listed as a noncarcinogenic TAP in IDAPA 58.01.01.585 (EL = 3.33 lb/hr), but must also be considered as a carcinogenic PAH (EL = 9.10E-05 lb/hr)

TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Pollutants shown in blue text are emitted only when burning Used Oil, but not when burning #2 Fuel Oil or Natural Gas

Facility: Knife River Corporation - Mountain West - 0053

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Permit/Facility ID:

P-2014.0004

777-00533

TAPs MODELING

POUNDS PER HOUR - POINT AND PSEUDO-STACK SOURCES

Maximum Controlled Emissions of Any Pollutant from Drum Mix HMA Plant with Fabric Filter, Tank Heater, Generator, Silo Fill/Load-out

A. Drum Mix Plant: 350 Tons/hour 929 Hours/year 325,000 Tons/year
Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected =

4,000 Tons/day
Used Oil Natural Gas LPG/Propane

B. Tank Heater: 0.6000 MMBtu Rated 4,000 Hours/year
Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected =

24 hrs/day
Natural Gas

C1. IC Engine: 0.00 gal/hour 0 Hours/year IC Engine < 600hp

#2 Fuel Oil

0 hrs/day

C2. IC Engine: 34.33 gal/hour 8760 Hours/year IC Engine > 600P

#2 Fuel Oil

13 hrs/day

Pollutant	A Drum Dryer Max Emission Rate for Pollutant (lb/hr)	B Asphaltic Oil Tank Heater Max Emission Rate for Pollutant (lb/hr)	C1 * see note IC1 < 600 bhp Generator Max Emission Rate for Pollutant (lb/hr)	C2 * see note IC2 > 600 bhp Generator Max Emission Rate for Pollutant (lb/hr)	D1 Silo Filling Emission Rate for Pollutant (lb/hr)	D2 Load-out Emission Rate for Pollutant (lb/hr)
PM (total)						
PM-10 (total)						
PM-2.5						
CO						
NOx						
SO ₂						
VOC						
Lead						
HCl ^e	7.35E-02	0.00E+00	0	0		
Dioxins^e						
2,3,7,8-TCDD	7.79E-12		0	0		
Total TCDD	3.45E-11		0	0		
1,2,3,7,8-PeCDD	1.15E-11		0	0		
Total PeCDD	8.16E-10		0	0		
1,2,3,4,7,8-HxCDD	1.56E-11	0.00E+00	0	0		
1,2,3,6,7,8-HxCDD	4.82E-11		0	0		
1,2,3,7,8,9-HxCDD	3.64E-11	0.00E+00	0	0		
Total HxCDD	4.45E-10		0	0		
1,2,3,4,6,7,8-HpCDD	1.78E-10	0.00E+00	0	0		
Total HpCDD	7.05E-10	0.00E+00	0	0		
Octa CDD	9.28E-10	0.00E+00	0	0		
Total PCDD ^h	2.93E-09	0.00E+00	0	0		
Furans^e						
2,3,7,8-TCDF	3.60E-11		0	0		
Total TCDF	1.37E-10	0.00E+00	0	0		
1,2,3,7,8-PeCDF	1.60E-10		0	0		
2,3,4,7,8-PeCDF	3.12E-11		0	0		
Total PeCDF	3.12E-09	0.00E+00	0	0		
1,2,3,4,7,8-HxCDF	1.48E-10		0	0		
1,2,3,6,7,8-HxCDF	4.45E-11		0	0		
2,3,4,6,7,8-HxCDF	7.05E-11		0	0		
1,2,3,7,8,9-HxCDF	3.12E-10		0	0		
Total HxCDF	4.82E-10	0.00E+00	0	0		
1,2,3,4,6,7,8-HpCDF	2.41E-10		0	0		
1,2,3,4,7,8,9-HpCDF	1.00E-10		0	0		
Total HpCDF	3.71E-10	0.00E+00	0	0		
Octa CDF	1.78E-10	0.00E+00	0	0		
Total PCDF ^h	1.48E-09	0.00E+00	0	0		
Total PCDD/PCDF ^h	4.45E-09	0.00E+00	0	0		
Non-PAH HAPs						
Acetaldehyde ^e	4.82E-02		0	0		
Acrolein ^e	4.33E-03		0	0		
Benzene ^e	1.45E-02	5.64E-07	0	0	1.45E-04	8.02E-05
1,3-Butadiene ^e			0	0		
Ethylbenzene ^e	4.00E-02		0	0	7.72E-04	1.94E-03
Formaldehyde ^e	1.15E-01	2.01E-05	0	0	3.12E-03	1.36E-04
Hexane ^e	1.53E-01	1.06E-03	0	0	2.03E-03	1.04E-03
Isooctane	6.67E-03		0	0	6.30E-06	1.25E-05
Methyl Ethyl Ketone ^e	3.33E-03		0	0	7.92E-04	3.40E-04
Pentane ^e		1.53E-03	0	0		
Propionaldehyde ^e	2.17E-02		0	0		
Quinone ^e	2.67E-02		0	0		
Methyl chloroform ^e	8.00E-03		0	0		
Toluene ^e	4.83E-01	2.00E-06	0	0	1.26E-03	1.46E-03
Xylene ^e	3.33E-02		0	0	5.22E-03	8.39E-03
POM (7-PAH Group)	2.03E-05	3.06E-09	0.00E+00	2.51E-05	1.71E-05	

e) IDAPA Toxic Air Pollutant

Pollutant	A Drum Dryer Max Emission Rate for Pollutant (lb/hr)	B Asphaltic Oil Tank Heater Max Emission Rate for Pollutant (lb/hr)	C1 * see note IC1 < 600 bhp Generator Max Emission Rate for Pollutant (lb/hr)	C2 * see note IC2 > 600 bhp Generator Max Emission Rate for Pollutant (lb/hr)	D Silo Filling Emission Rate for Pollutant (lb/hr)	D2 Load-out Emission Rate for Pollutant (lb/hr)
PAH HAPs						
2-Methylnaphthalene	6.31E-03	6.45E-09	0	0	4.96E-04	3.01E-04
3-Methylchloranthrene ^e	0.00E+00	4.83E-10	0	0		
Acenaphthene	5.19E-05	4.83E-10	0	0	4.43E-05	3.29E-05
Acenaphthylene	8.16E-04	4.83E-10	0	0	1.32E-06	3.54E-06
Anthracene	1.15E-04	6.45E-10	0	0	1.22E-05	8.85E-06
Benzo(a)anthracene ^e	7.79E-06	4.83E-10	0	0	5.27E-06	2.40E-06
Benzo(a)pyrene ^e	3.64E-07	3.22E-10	0	0	0.00E+00	2.91E-07
Benzo(b)fluoranthene ^e	3.71E-06	4.83E-10	0	0	0.00E+00	9.61E-07
Benzo(e)pyrene	4.08E-06	0.00E+00	0	0	8.95E-07	9.87E-07
Benzo(g,h,i)perylene	1.48E-06	3.22E-10	0	0	0.00E+00	2.40E-07
Benzo(k)fluoranthene ^e	1.52E-06	4.83E-10	0	0	0.00E+00	2.78E-07
Chrysene ^e	6.68E-06	4.83E-10	0	0	1.98E-05	1.30E-05
Dibenz(a,h)anthracene ^e	0.00E+00	3.22E-10	0	0	0.00E+00	4.68E-08
Dichlorobenzene	0.00E+00	3.22E-07	0	0		
Fluoranthene	2.26E-05	8.06E-10	0	0	1.41E-05	6.32E-06
Fluorene	4.08E-04	7.52E-10	0	0	9.51E-05	9.74E-05
Indeno(1,2,3-cd)pyrene ^e	2.60E-07	4.83E-10	0	0	0.00E+00	5.94E-08
Naphthalene ^e	2.41E-02	1.64E-07	0	0	1.71E-04	1.58E-04
Perylene	3.26E-07	0.00E+00	0	0	2.83E-06	2.78E-06
Phenanthrene	8.53E-04	4.57E-09	0	0	1.70E-04	1.02E-04
Pyrene	1.11E-04	1.34E-09	0	0	4.14E-05	1.90E-05
Non-HAP Organic Compounds						
Acetone ^e	1.38E-01	0.00E+00	0	0	1.12E-03	3.24E-04
Benzaldehyde	1.83E-02	0.00E+00	0	0		
Butane	1.12E-01	1.24E-03	0	0		
Butyraldehyde	2.67E-02	0.00E+00	0	0		
Crotonaldehyde ^e	1.43E-02	0.00E+00	0	0		
Ethylene	1.17E+00	0.00E+00	0	0	2.23E-02	4.92E-03
Heptane	1.57E+00	0.00E+00	0	0		
Hexanal	1.83E-02	0.00E+00	0	0		
Isovaleraldehyde	5.33E-03	0.00E+00	0	0		
2-Methyl-1-pentene	6.67E-01	0.00E+00	0	0		
2-Methyl-2-butene	9.67E-02	0.00E+00	0	0		
3-Methylpentane	3.17E-02	0.00E+00	0	0		
1-Pentene	3.67E-01	0.00E+00	0	0		
n-Pentane	3.50E-02	0.00E+00	0	0		
Valeraldehyde ^e	1.12E-02	0.00E+00	0	0		
Metals						
Antimony ^e	3.00E-05	0.00E+00	0	0		
Arsenic ^e	2.08E-05	5.37E-08	0	0		
Barium ^e	9.67E-04	2.59E-06	0	0		
Beryllium ^e	0.00E+00	3.22E-09	0	0		
Cadmium ^e	1.52E-05	2.95E-07	0	0		
Chromium ^e	9.17E-04	8.24E-07	0	0		
Cobalt ^e	4.33E-06	4.94E-08	0	0		
Copper ^e	5.17E-04	5.00E-07	0	0		
Hexavalent Chromium ^e	1.67E-05	0.00E+00	0	0		
Manganese ^e	1.28E-03	0.00E+00	0	0		
Mercury ^e	4.33E-04	0.00E+00	0	0		
Molybdenum ^e	0.00E+00	6.47E-07	0	0		
Nickel ^e	2.34E-03	0.00E+00	0	0		
Phosphorus ^e	4.67E-03	0.00E+00	0	0		
Silver ^e	8.00E-05	0.00E+00	0	0		
Selenium ^e	5.83E-05	0.00E+00	0	0		
Thallium ^e	6.83E-07	0.00E+00	0	0		
Vanadium ^e	0.00E+00	1.35E-06	0	0		
Zinc ^e	1.02E-02	0.00E+00	0	0		

Criteria Pollutant lb/hr emissions are maximum 1-hr averages

TAPs lb/hr rates are 24-hr averages except for those in bold text. Lb/hr rates for bold TAPs (carcinogens) are annual averages.

Pollutants shown in blue text are emitted only when burning Used Oil, but not when burning #2 Fuel Oil or Natural Gas

APPENDIX B – AMBIENT AIR QUALITY IMPACT ANALYSIS

MEMORANDUM

DATE: June 24, 2020

TO: Chris Duerschner, Permit Writer, Air Program

FROM: Kevin Schilling, Stationary Source Modeling Coordinator, Air Program

PROJECT: P-2014.0004 PROJ 62427, Permit to Construct (PTC) for Knife River Corporation portable Hot Mix Asphalt Plant.

SUBJECT: Demonstration of Compliance with IDAPA 58.01.01.203.02 (NAAQS) and 203.03 (TAPs) as it relates to air quality impact analyses.

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Acronyms, Units, and Chemical Nomenclature

AAC	Acceptable Ambient Concentration of a non-carcinogenic TAP
AACC	Acceptable Ambient Concentration of a Carcinogenic TAP
acfm	Actual cubic feet per minute
AERMAP	The terrain data preprocessor for AERMOD
AERMET	The meteorological data preprocessor for AERMOD
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
Appendix W	40 CFR 51, Appendix W – Guideline on Air Quality Models
As	Arsenic
bhp	brake horsepower
BPIP	Building Profile Input Program
BRC	Below Regulatory Concern
CBP	Concrete Batch Plant
CFR	Code of Federal Regulations
CMAQ	Community Multi-Scale Air Quality Modeling System
CO	Carbon Monoxide
DEM	Digital Elevation Map
DEQ	Idaho Department of Environmental Quality
EL	Emissions Screening Level of a TAP
EPA	United States Environmental Protection Agency
GB	Americrete Ready Mix dba GB Redi-Mix
GEP	Good Engineering Practice
hr	hours
IC	internal combustion
Idaho Air Rules	Rules for the Control of Air Pollution in Idaho, located in the Idaho Administrative Procedures Act 58.01.01
ISCST3	Industrial Source Complex Short Term 3 dispersion model
K	Kelvin
Knife River	Knife River Corporation
m	Meters
m/sec	Meters per second
MMBtu	Million British Thermal Units
NAAQS	National Ambient Air Quality Standards
NO	Nitrogen Oxide
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
NWS	National Weather Service
O ₃	Ozone
PAH	Polyaromatic Hydrocarbons
Pb	Lead
PM ₁₀	Particulate matter with an aerodynamic particle diameter less than or equal to a nominal 10 micrometers
PM _{2.5}	Particulate matter with an aerodynamic particle diameter less than or equal to a nominal 2.5 micrometers

POM	Polycyclic Organic Matter
ppb	parts per million
PRIME	Plume Rise Model Enhancement
PTC	Permit to Construct
PTE	Potential to Emit
RFO	Recycled Fuel Oil
SIL	Significant Impact Level
SO ₂	Sulfur Dioxide
TAP	Toxic Air Pollutant
tpy	tons per year
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds
µg/m ³	Micrograms per cubic meter of air

1.0 Summary

Knife River Corporation (Knife River) submitted a Permit to Construct (PTC) application to modify their existing permit P-2014.0004 for operation of a portable hot mix asphalt (HMA) plant in Idaho. Idaho Administrative Procedures Act 58.01.01.203.02 and 203.03 (Idaho Air Rules Section 203.02 and 203.03) requires that no permit be issued unless it is demonstrated that applicable emissions do not result in violation of a National Ambient Air Quality Standard (NAAQS) or Toxic Air Pollutant (TAP) increment. This memorandum provides a summary of the applicable impact analysis requirements and a summary of those analyses used to demonstrate compliance with applicable NAAQS and TAP increments, as required by Idaho Air Rules Section 203.02 and 203.03.

The requested permit modification adds an operational scenario for decreased hourly and daily production, increased stack height for the drum dryer, use of lower-emitting engines to power generators, and a resulting smaller required setback distance between emission sources and the facility boundary. Knife River requested to keep the existing scenarios with established setbacks unchanged in the PTC, adding the new scenario as an additional option.

Air impact analyses were performed by Jacobs, Knife River's permitting consultant, and were submitted with the PTC application. DEQ review of submitted data and analyses, as summarized by this memorandum, addressed only the rules, policies, methods, and data pertaining to the air impact analyses used to demonstrate that estimated emissions associated with operation of the facility will not cause or significantly contribute to a violation of any applicable air quality standard. This review did not address/evaluate compliance with other rules or analyses not pertaining to the air impact analyses. Evaluation of emission estimates was primarily the responsibility of the DEQ permit writer and is addressed in the main body of the DEQ Statement of Basis.

Table 1 presents key assumptions and results to be considered in the development of the permit. Idaho Air Rules require air impact analyses be conducted in accordance with methods outlined in 40 CFR 51, Appendix W *Guideline on Air Quality Models* (Appendix W). Appendix W requires that air quality impacts be assessed using atmospheric dispersion models with emissions and operations representative of design capacity or as limited by a federally enforceable permit condition. Table 1 addresses only the proposed additional operational scenario, not the existing permitted scenarios that Knife River requests to remain unaltered.

The submitted information and analyses, in combination with DEQ's analyses: 1) utilized appropriate methods and models; 2) was conducted using reasonably accurate or conservative model parameters and input data (review of emissions estimates was addressed by the DEQ permit writer); 3) adhered to established DEQ guidelines for new source review dispersion modeling; 4) showed either a) that estimated potential/allowable emissions are at a level defined as below regulatory concern (BRC) and do not require a NAAQS compliance demonstration; b) that predicted pollutant concentrations from emissions associated with the project as modeled were below Significant Impact Levels (SILs) or other applicable regulatory thresholds; or c) that predicted pollutant concentrations from emissions associated with the project as modeled, when appropriately combined with co-contributing sources and background concentrations, were below applicable NAAQS at ambient air locations where and when the project has a significant impact; 5) showed that TAP emissions increases associated with the project will not result in increased emissions above ELs or ambient air impacts exceeding allowable TAP increments. This conclusion assumes that conditions in Table 1 are representative of facility design capacity or operations as limited by a federally enforceable permit condition. The DEQ permit writer should use Table 1 and other information presented in this memorandum to generate appropriate permit provisions/restrictions to

assure the requirements of Appendix W are met regarding emissions representative of design capacity or permit allowable rates.

Summary of Submittals and Actions

- April 9, 2020: Application received by DEQ.
- April 16, 2020: Regulatory start date.
- May 15, 2020: Application determined complete by DEQ.

Table 1. KEY CONDITIONS USED IN MODELING ANALYSES	
Criteria/Assumption/Result for Additional Operational Scenario	Explanation/Consideration
<p>Setback from Ambient Air Boundary. The following minimum setback distances between the nearest point of potential public access and the stacks of the drum dryer must be maintained:</p> <ol style="list-style-type: none"> 1) When using IC engines to power generators the setback must be 459 feet (140 meters). 2) When not using IC engines to power generators the setback must be 459 feet (140 meters). 	<p>The applicable setback distance is necessary to assure compliance with air quality standards at ambient air locations. Areas not under direct control of the permittee cannot be excluded from consideration as ambient air. Setback distances were not increased by adding the engines because of the low emission rates of the EPA Tier 4 certified engines and the high emission stacks.</p>
<p>Allowable Production. Maximum HMA production when using this operational scenario does not exceed allowable rates of 350 ton/hour, 4,000 ton/day, and 325,000 ton/year.</p>	<p>Short-term and annual pollutant impact analyses were performed using emissions based on these rates. These rates must not be exceeded.</p>
<p>Annual Relocation Requirement. Air impact analyses were performed considering that the HMA plant could remain at any single site for a duration of more than 12 months.</p>	<p>NAAQS compliance is assured for operations exceeding 12 months, provided other operational conditions are met. A permit condition is not needed to restrict operations at any specific site to not greater than 12 months.</p>
<p>Operations with Generators. When diesel-fired generators are used, impacts were based on using two 670 brake horsepower (bhp) Tier 4 engines. The engines may operate simultaneously, and each engine is limited to 13 hour/day and 1,161 hour/year of operation.</p>	<p>Engines used at the site must be no larger than 670 bhp and they must emit at levels no greater than Tier 4 specifications. The analysis assumes no other non-vehicle engines are operated at the facility.</p>
<p>Seasonal Operations. Air impact analyses were performed using the condition that the HMA plant will not operate during December 1 through March 31.</p>	<p>NAAQS compliance is not assured if operations occur during December 1 - March 31. A permit condition is needed to restrict operations from this period.</p>
<p>Control of Vehicle Fugitive Emissions: Air impact analyses were performed assuming fugitive particulate emissions from vehicle traffic on unpaved roadways is negligible and could be reasonably accounted for in the background concentration used.</p>	<p>Emissions from vehicle traffic must be controlled to a high degree, otherwise compliance with particulate NAAQS has not been demonstrated.</p>
<p>General Emissions Rates. Emissions rates used in the impact analyses, as listed in this memorandum, must represent maximum emissions as given by design capacity, inherently limited by the process or configuration of the facility, or as limited by the issued permit for the specific pollutant and averaging period.</p>	<p>Compliance has not been demonstrated for emissions rates greater than those used in the modeling analyses.</p>
<p>Location with other pollutant emitting equipment. Co-contributing emissions sources such as other HMA plants, concrete batch plants (CBPs), and/or rock crushing plants will not locate on the plant property within 1,000 feet of the drum dryer stack of the HMA plant, except as noted below for a rock crushing plant. NAAQS compliance is assured for the HMA plant with a</p>	<p>Emissions are considered co-contributing if they occur within 1,000 feet (305 meters) of each other. Once the HMA plant is established at a specific site, that facility is not responsible for controlling other facilities from moving in nearby, provided they are not on the same</p>

Table 1. KEY CONDITIONS USED IN MODELING ANALYSES	
Criteria/Assumption/Result for Additional Operational Scenario	Explanation/Consideration
co-contributing rock crushing plant, provided asphalt production is half the daily allowable rate (2,000 ton/day) during any day when the rock crushing plant is operated and the annual actual throughput of the rock crushing plant is less than 500,000 ton/year.	property as the permittee. Neighboring facilities would be required to account for the HMA impacts for their own permitting analyses.
Relocating to Sites with Co-Contributing Facilities. The HMA plant will not be relocated to a site where there are co-contributing stationary emissions sources within 1,000 feet of the drum dryer stack except as noted for a rock crushing plant above.	After the HMA plant is established at a location, the permittee is not responsible for ensuring neighboring facilities (on different properties) do not move in nearby.
Operation in Non-Attainment Areas: The HMA plant will not locate within any area designated as non-attainment for a NAAQS.	Impact analyses performed for this project assumed background concentrations of criteria pollutants are well below NAAQS.
Release Parameters for Emission Points. Stack heights are no shorter than what is indicated in this memorandum. Stack diameters are no larger than what is indicated in this memorandum. Exhaust flow rates and temperatures at the point of release are not less than about 80 percent of the values indicated in this memorandum.	Compliance with applicable air quality standards are not assured if release parameters vary substantially from what was used in impact analyses.

2.0 Background Information

This section provides background information applicable to the project and the site where the facility will be located. It also provides a brief description of the applicable air impact analyses requirements for the project.

2.1 Project Description, Proposed Location, and Area Classification

The proposed project is addition of an operational scenario to the facility's existing PTC (P-2014.0004). Knife River requested that existing operational scenarios in the PTC remain unchanged. The new operational scenario includes the following:

- 1) production rates not to exceed 350 ton/hour, 4,000 ton/day, and 325,000 ton/year;
- 2) when generators are used, they will be powered by two diesel-fired internal combustion (IC) engines, each 670 bhp, EPA Tier 4 Certified, and each not operating more than 13 hour/day and 1,161 hour/year;
- 3) the drum dryer stack will be increased to not less than 36 feet;
- 4) the drum dryer may be fueled by natural gas, LPG, or Recycled Fuel Oil (RFO) with a sulfur content not to exceed 0.5 percent;
- 5) the plant will operate on a seasonal basis, with no operations from December 1 through March 3;
- 6) a setback between the drum dryer stack and the nearest facility boundary will be no less than 459 feet.

Pollutant-emitting processes conducted at the HMA plant include drum drying aggregate and mixing with asphalt oil, handling of aggregate materials, handling of produced asphalt, and operation of IC engines to power electrical generators.

DEQ's air impact analyses for portable facilities involves modeling a generic layout of sources and structures. The sources are placed in a tight grouping at the center of a polar grid of receptors and impacts are assessed using a variety of meteorological datasets collected in Idaho. A setback distance is established for each analysis. This distance is the minimum distance between the emission source and the closest point of public access that is necessary to assure compliance with applicable air quality standards. DEQ's process is to perform these analyses for applicants using the requested production levels and equipment characteristics specified in the submitted application.

Knife River, through their consultant Jacobs, performed their own analyses to optimize parameters that affect setback distances. To accomplish this, Jacobs requested DEQ computer modeling files and data that were used to assess the impacts and generate setbacks for a different HMA plant project. Jacobs modified the files for characteristics unique to the Knife River HMA plant, performed the impact modeling analyses, and proposed a minimum required setback. Knife River then submitted the project-specific modeling files and data with the application. DEQ's review involved verifying and justifying model inputs and rerunning the model for critical scenarios (those pollutants and meteorological datasets that resulted in the largest required setback distances).

2.2 Air Impact Analyses Required for All Permits to Construct

Criteria Pollutant and TAP Impact Analyses for a PTC are addressed in Idaho Air Rules Sections 203.02 and 203.03:

No permit to construct shall be granted for a new or modified stationary source unless the applicant shows to the satisfaction of the Department all of the following:

02. NAAQS. *The stationary source or modification would not cause or significantly contribute to a violation of any ambient air quality standard.*

03. Toxic Air Pollutants. *Using the methods provided in Section 210, the emissions of toxic air pollutants from the stationary source or modification would not injure or unreasonably affect human or animal life or vegetation as required by Section 161. Compliance with all applicable toxic air pollutant carcinogenic increments and toxic air pollutant non-carcinogenic increments will also demonstrate preconstruction compliance with Section 161 with regards to the pollutants listed in Sections 585 and 586.*

Atmospheric dispersion modeling, using computerized simulations, is used to demonstrate compliance with both NAAQS and TAPs. Idaho Air Rules Section 202.02 states:

Estimates of Ambient Concentrations. *All estimates of ambient concentrations shall be based on the applicable air quality models, data bases, and other requirements specified in 40 CFR 51 Appendix W (Guideline on Air Quality Models).*

2.3 Significant Impact Level and Cumulative NAAQS Impact Analyses

The SIL analysis for a new facility or proposed modification to a facility involves modeling estimated criteria air pollutant emissions from the facility or modification to determine the potential impacts to

ambient air. Air impact analyses are required by Idaho Air Rules to be conducted according to methods outlined in Appendix W. Appendix W requires that facilities be modeled using emissions and operations representative of design capacity or as limited by a federally enforceable permit condition.

A facility or modification is considered to have a significant impact on air quality if maximum modeled impacts to ambient air exceed the established SIL listed in Idaho Air Rules Section 006 (referred to as a “significant contribution” in Idaho Air Rules) or as incorporated by reference as per Idaho Air Rules Section 107.03.b. Table 2 lists the applicable SILs.

If modeled maximum pollutant impacts to ambient air from the emissions sources associated with a new facility or modification exceed the SILs, then a cumulative NAAQS impact analysis is necessary to demonstrate compliance with NAAQS and Idaho Air Rules Section 203.02.

A cumulative NAAQS impact analysis for attainment area pollutants involves assessing ambient impacts (typically the design values consistent with the form of the standard) from facility-wide emissions, and emissions from any nearby co-contributing sources, and then adding a DEQ-approved background concentration value to the modeled result that is appropriate for the criteria pollutant/averaging-period at the facility location and the area of significant impact. The resulting pollutant concentrations in ambient air are then compared to the NAAQS listed in Table 2. Table 2 also lists SILs and specifies the modeled design value that must be used for comparison to the NAAQS. NAAQS compliance is evaluated on a receptor-by-receptor basis for the modeling domain.

If the cumulative NAAQS impact analysis indicates a violation of the standard, the permit may not be issued if the proposed project contributes (usually defined as impacts exceeding the SIL) to the modeled violation. This evaluation is made specific to both time and space. As an example, consider a hypothetical case where the SIL analysis indicates the project (new source or modification) has impacts exceeding the SIL and the cumulative impact analysis indicates a violation of the NAAQS. If project-specific impacts are below the SIL at the specific receptors showing the violations during the times when modeled violations occurred, then the project does not have a significant contribution to the specific violations.

Compliance with Idaho Air Rules Section 203.02 is generally demonstrated if: a) applicable specific criteria pollutant emission increases are at a level defined as BRC, using the criteria established by DEQ regulatory interpretation¹ (see Section 3.1.1 of this memorandum); or b) all modeled impacts of the SIL analysis are below the applicable SIL or other level determined to be inconsequential to NAAQS compliance; or c) modeled design values of the cumulative NAAQS impact analysis (modeling all emissions from the facility and co-contributing sources, and adding a background concentration) are less than applicable NAAQS at receptors where impacts from the proposed facility/modification exceeded the SIL or other identified level of consequence; or d) if the cumulative NAAQS analysis showed NAAQS violations, the impact of proposed facility/modification to any modeled violation was inconsequential (typically assumed to be less than the established SIL) for that specific receptor and for the specific modeled time when the violation occurred.

2.4 Toxic Air Pollutant Analyses

Emissions of toxic substances are generally addressed by Idaho Air Rules Section 161:

Any contaminant which is by its nature toxic to human or animal life or vegetation shall not be emitted in such quantities or concentrations as to alone, or in combination with other contaminants, injure or unreasonably affect human or animal life or vegetation.

Table 2. APPLICABLE REGULATORY LIMITS				
Pollutant	Averaging Period	Significant Impact Levels^a (µg/m³)^b	Regulatory Limit^c (µg/m³)	Modeled Design Value Used^d
PM ₁₀ ^e	24-hour	5.0	150 ^f	Maximum 6 th highest ^g
PM _{2.5} ^h	24-hour	1.2	35 ⁱ	Mean of maximum 8 th highest ^j
	Annual	0.2	12 ^k	Mean of maximum 1 st highest ^l
Carbon monoxide (CO)	1-hour	2,000	40,000 ^m	Maximum 2 nd highest ⁿ
	8-hour	500	10,000 ^m	Maximum 2 nd highest ⁿ
Sulfur Dioxide (SO ₂)	1-hour	3 ppb ^o (7.8 µg/m ³)	75 ppb ^p (196 µg/m ³)	Mean of maximum 4 th highest ^q
	3-hour	25	1,300 ^m	Maximum 2 nd highest ⁿ
Nitrogen Dioxide (NO ₂)	1-hour	4 ppb (7.5 µg/m ³)	100 ppb ^r (188 µg/m ³)	Mean of maximum 8 th highest ^s
	Annual	1.0	100 ^t	Maximum 1 st highest ⁿ
Lead (Pb)	3-month ^u	NA	0.15 ^t	Maximum 1 st highest ⁿ
	Quarterly	NA	1.5 ^t	Maximum 1 st highest ⁿ
Ozone (O ₃)	8-hour	40 TPY VOC ^v	70 ppb ^w	Not typically modeled

- ^a Idaho Air Rules Section 006 (definition for significant contribution) or as incorporated by reference as per Idaho Air Rules Section 107.03.b.
- ^b Micrograms per cubic meter.
- ^c Incorporated into Idaho Air Rules by reference, as per Idaho Air Rules Section 107.
- ^d The maximum 1st highest modeled value is always used for the significant impact analysis unless indicated otherwise. Modeled design values are calculated for each ambient air receptor.
- ^e Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
- ^f Not to be exceeded more than once per year on average over 3 years.
- ^g Concentration at any modeled receptor when using five years of meteorological data.
- ^h Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
- ⁱ 3-year mean of the upper 98th percentile of the annual distribution of 24-hour concentrations.
- ^j 5-year mean of the 8th highest modeled 24-hour concentrations at the modeled receptor for each year of meteorological data modeled. For the SIL analysis, the 5-year mean of the 1st highest modeled 24-hour impacts at the modeled receptor for each year.
- ^k 3-year mean of annual concentration. The NAAQS was revised from 15 µg/m³ to 12 µg/m³ on December 14, 2012. However, this standard will not be applicable for permitting purposes in Idaho until it is incorporated by reference *sine die* into Idaho Air Rules (Spring 2014).
- ^l 5-year mean of annual averages at the modeled receptor.
- ^m Not to be exceeded more than once per year.
- ⁿ Concentration at any modeled receptor.
- ^o Interim SIL established by EPA policy memorandum.
- ^p 3-year mean of the upper 99th percentile of the annual distribution of maximum daily 1-hour concentrations.
- ^q 5-year mean of the 4th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of 1st highest modeled 1-hour impacts for each year is used.
- ^r 3-year mean of the upper 98th percentile of the annual distribution of maximum daily 1-hour concentrations.
- ^s 5-year mean of the 8th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of maximum modeled 1-hour impacts for each year is used.
- ^t Not to be exceeded in any calendar year.
- ^u 3-month rolling average.
- ^v An annual emissions rate of 40 ton/year of VOCs is considered significant for O₃.
- ^w Annual 4th highest daily maximum 8-hour concentration averaged over three years.

Permitting requirements for TAPs from new or modified sources are specifically addressed by Idaho Air Rules Section 203.03 and require the applicant to demonstrate to the satisfaction of DEQ the following:

Using the methods provided in Section 210, the emissions of toxic air pollutants from the stationary source or modification would not injure or unreasonably affect human or animal life or vegetation as required by Section 161. Compliance with all applicable toxic air pollutant carcinogenic increments and toxic air pollutant non-carcinogenic increments will also demonstrate preconstruction compliance with Section 161 with regards to the pollutants listed in Sections 585 and 586.

Per Section 210, if the total project-wide emissions increase of any TAP associated with a new source or modification exceeds screening emission levels (ELs) of Idaho Air Rules Section 585 or 586, then the ambient impact of the emissions increase must be estimated. If ambient impacts are less than applicable Acceptable Ambient Concentrations (AACs) for non-carcinogens of Idaho Air Rules Section 585 and Acceptable Ambient Concentrations for Carcinogens (AACCs) of Idaho Air Rules Section 586, then compliance with TAP requirements has been demonstrated.

Idaho Air Rules Section 210.20 states that if TAP emissions from a specific source are regulated by the Department or EPA under 40 CFR 60, 61, or 63, then a TAP impact analysis under Section 210 is not required for that TAP. The DEQ permit writer evaluates the applicability of specific TAPs to the Section 210.20 exclusion.

3.0 Analytical Methods and Data

This section describes the methods and data used in analyses to demonstrate compliance with applicable air quality impact requirements.

3.1 Emission Source Data

Emissions of criteria pollutants and TAPs resulting from operation of the HMA plant were calculated by Jacobs and DEQ for various applicable averaging periods. A modification of DEQ's HMA plant emission calculation spreadsheet was used to calculate emissions for the facility, given the specified equipment and requested operational rates. Jacobs and DEQ air impact analyses assured that the estimated potential emissions rates were properly used in the model. The rates listed must represent the maximum allowable rate as averaged over the specified period.

Emissions rates used in the dispersion modeling analyses, as listed in this memorandum, should be reviewed by the DEQ permit writer and compared with those in the final emissions inventory used in the DEQ Statement of Basis. All modeled criteria air pollutant and TAP emissions rates must be equal to or greater than the facility's potential emissions calculated in the PTC emissions inventory or proposed permit allowable emission rates. Emission calculations are described in more detail in Attachment 1.

3.1.1 Criteria Pollutant Emissions Rates and Modeling Applicability

Exclusion of BRC Sources from NAAQS Compliance Demonstration Requirements

A criteria pollutant-specific NAAQS compliance demonstration may not be required where facility-wide potential to emit (PTE) values for that criteria pollutant would qualify for a BRC permit exemption as per Idaho Air Rules Section 221 (equal to 10 percent of the emissions defined as significant) if it were not for potential emissions of other criteria pollutants or TAPs. DEQ's regulatory interpretation policy of exemption provisions of Idaho Air Rules is that: "A DEQ NAAQS compliance assertion will not be made by the DEQ modeling group for specific criteria pollutants having a project emissions increase below BRC levels, provided the proposed project would have qualified for a Category I Exemption for BRC emissions quantities except for the emissions of another criteria pollutant.¹" The interpretation policy also states that the exemption criteria of uncontrolled PTE not to exceed 100 ton/year (Idaho Air Rules Section 220.01.a.i) is not applicable when evaluating whether a NAAQS impact analyses is required. A permit will be issued limiting PTE below 100 ton/year, thereby negating the need to maintain calculated uncontrolled PTE under 100 ton/year.

The DEQ emission inventory asserts that facility-wide controlled PTE emissions of certain criteria pollutants are above BRC levels, as listed in Table 3. Emissions considered in this calculation are only non-fugitive emissions from the HMA plant, including: the drum dryer, generator engines, and loadout from the asphalt silo. Emissions from material handling of aggregate are considered fugitive, and as such were excluded from permit-applicability PTE. Emissions from the operation of IC engines powering generators included in permit-applicability PTE. These engines are not excluded as non-road engines because they may remain at a given site for longer than 12 months.

Criteria Pollutant	BRC Level (ton/year)	Applicable Facility Wide PTE Emissions (ton/year)	Air Impact Analyses Required?
PM ₁₀ ^a	1.5	4.0	Yes
PM _{2.5} ^b	1.0	3.8	Yes
Carbon Monoxide (CO)	10.0	21.6	Yes
Sulfur Dioxide (SO ₂)	4.0	14.5	Yes
Nitrogen Oxides (NOx)	4.0	9.7	Yes
Lead (Pb)	0.06	0.0024	No
Ozone (as VOC)	4.0	6.1	Yes

^{a.} Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

^{b.} Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

Table 4 lists criteria pollutant emission rates used in the DEQ site-specific impact modeling analyses for the specified HMA Plant. Attachment 1 provides additional details of DEQ emission calculations used in the impact modeling analyses.

Fugitive particulate emissions from frontend loader handling of aggregate materials and three conveyor transfers were designated as volume source emissions point LOADCONV in the model. Two transfers were included for the frontend loader source: 1) transfer of aggregate from truck unloading or other transfer means to a storage pile; 2) transfer of aggregate from the storage pile to a hopper. Three transfers were included with this source for aggregate conveyors. Emissions rates for LOADCONV are a function of wind speed and were varied in the model according to wind speed. Attachment 1 provides details on these emissions calculations.

The submitted application indicated that emissions from asphalt silo filling are captured and routed back to the drum dryer. Drum dryer emission rates in the applicant's submitted modeling files assume that this configuration will eliminate emissions from the silo loading point and will have a negligible impact on emissions from the drum dryer. DEQ verification analyses conservatively added emissions from silo loading to those estimated for the drum dryer.

DEQ's analyses also varied from the submitted analysis for PM_{2.5} emissions from the diesel-fired IC engines powering generators. The DEQ calculation spreadsheet generated higher PM_{2.5} emissions than PM₁₀. Since this is physically impossible, the approach used in the application was to use the higher value for PM₁₀ and PM_{2.5} in the impact modeling analyses. Further evaluation by DEQ revealed that the PM_{2.5} value in the spreadsheet did not account for lower emissions from EPA Tier-certified engines. PM₁₀ emissions from engines were more refined in the spreadsheet than PM_{2.5}, with the spreadsheet varying PM₁₀ emissions by the EPA Tier certification level of the engine. DEQ's analyses used PM₁₀ emissions from the IC engines for PM_{2.5} impact modeling as well.

Table 4. HMA PLANT EMISSIONS USED IN DEQ ANALYSES			
Emissions Point in Model	Pollutant	Averaging Period	Emissions Rate (lb/hr)^a
DRYER – asphalt drum dryer/mixer - emissions controlled by a baghouse	PM _{2.5}	24-hour	3.717 ^b
		Annual	1.237 ^c
	PM ₁₀	24-hour	3.833 ^b
		NOx	1-hour
			Annual
		SO ₂	1-hour
	CO	1-hour	45.50
HOTOIL – 0.6 MMBtu/hour natural gas heater	PM _{2.5}	24-hour	0.004471 ^b
		Annual	0.003053 ^c
	PM ₁₀	24-hour	0.004471 ^b
		NOx	1-hour
			Annual
		SO ₂	1-hour
	CO	1-hour	0.04941
GEN1 – IC engine powering HMA plant - 672 bhp Tier 4 - 13 hour/day, 1,161 hour/year operation	PM _{2.5}	24-hour	0.01197 ^b (0.0217) ^{b,d,e}
		Annual	0.004380 ^c (0.00397) ^{c,d}
	PM ₁₀	24-hour	0.001197 ^b (0.0217) ^{b,d,e}
		NOx	1-hour
			Annual
		SO ₂	1-hour
	CO	1-hour	0.000 ^d
GEN2 – IC engine powering HMA plant - 672 bhp Tier 4 - 13 hour/day, 1,161 hour/year operation	PM _{2.5}	24-hour	0.01197 ^b (0.0217) ^{b,d,e}
		Annual	0.004380 ^c (0.00397) ^{c,d}
	PM ₁₀	24-hour	0.001197 ^b (0.0217) ^{b,d,e}
		NOx	1-hour
			Annual
		SO ₂	1-hour
	CO	1-hour	0.000 ^d
SILOFILL – loading of asphalt storage silo ^g	PM _{2.5}	24-hour	0.09765 ^b
		Annual	0.03252 ^c
	PM ₁₀	24-hour	0.09765 ^b
		CO	1-hour
LOAD – asphalt loadout from silo to truck	PM _{2.5}	24-hour	0.08699 ^b
		Annual	0.02896 ^c
	PM ₁₀	24-hour	0.08699 ^b
		CO	1-hour
LOADCONV – aggregate handling by frontend loader and conveyor transfers	PM _{2.5}	24-hour	0.08711 ^{b,h}
		Annual	0.02901 ^{c,h}
	PM ₁₀	24-hour	0.5752 ^{b,h}
		SCREEN – scalping screen	PM _{2.5}
Annual	0.0006926 ^c		
PM ₁₀	24-hour		0.1392 ^b

- a. Pounds per hour emission rate used in impact modeling analyses for specified averaging periods.
- b. Calculated by multiplying the daily throughput or daily operational hours by the emission factor, then dividing by 24 hours/day.
- c. Emissions rate is equal to annual emissions divided over 5,856 hours/year (emissions were not modeled for December 1 through March 31 to account for the seasonal restriction).
- d. Value used in modeling performed by Jacobs, using hourly engine-specific performance data provided by the manufacturer for PM_{2.5}, PM₁₀, NOx, and CO. DEQ's analyses for PM_{2.5}, PM₁₀, and CO used values generated by DEQ's unaltered HMA calculation spreadsheet, with emissions based on Tier 4 certification levels.
- e. Review of the calculation revealed this value represents both engines combined rather than a single engine.
- f. This compares to an emission rate of 2.21 pound/hour for 1-hour NOx and 0.293 pound/hour for annual NOx, as calculated by DEQ's unaltered HMA plant calculation sheet.
- g. The application indicates that these emissions are routed back to the drum dryer. DEQ modeled these emissions from the drum dryer (adding these values to those of the drum dryer).
- h. Emissions are varied in the model according to wind speed category (see Attachment 1). Emissions listed are based on a 10 miles/hour (mph) wind speed.

Exclusion from Impact Analyses by Modeling Thresholds

DEQ may determine that reasonably expected impacts from specific criteria pollutant emissions, for those pollutants not excluded from analysis by DEQ's regulatory interpretation policy of exemption provisions (discussed above), are so minimal that NAAQS compliance is assured without the need to perform a project-specific impact analysis. Modeling applicability threshold emission values were established to evaluate the level below which NAAQS compliance is effectively assured. These thresholds are established in the *Idaho Air Quality Modeling Guideline*² (<http://www.deq.idaho.gov/media/1029/modeling-guideline.pdf>). Modeling thresholds, for criteria pollutants other than Pb, were developed to ensure modeled impacts are less than the SIL for sources with good dispersion characteristics (at least as good as those associated with the source modeled for generation of the thresholds). The modeling threshold for Pb was set to assure compliance with the NAAQS, since there is no SIL for Pb.

Total project emissions are provided in Table 5 along with Level I and Level II Modeling Applicability Thresholds.

Estimated emissions exceed Level I Modeling Thresholds by a considerable margin. Level II Modeling Thresholds are not appropriate for PM₁₀ and PM_{2.5} because of the poor dispersion characteristics of fugitive particulate emissions. Level II Modeling Thresholds are questionably appropriate for CO, NO_x, and SO₂ emissions from the dryer stack. Compared to parameters in the modeling analyses used to develop Level II thresholds, the HMA sources have a slightly shorter stack height, but will still achieve good dispersion from the high volume of hot exhaust from the drum dryer. Emissions are also distributed among three different sources rather than a single, concentrated point. Additionally, the thresholds are designed to assure an impact below the SIL, and estimated emissions are facility-wide. Therefore, impacts slightly above the SIL would almost certainly still result in a cumulative impact well below NAAQS. Allowable emissions of 1-hour CO were substantially below the 175 pound/hour Level II Modeling Threshold and project-specific air impact analyses were not performed for CO.

Pollutant / Averaging Period	Emission Rate^a	Level I Threshold^b	Level II Threshold^c	Project-Specific Air Impact Analyses Required
PM _{2.5} ^d 24-hour	4.0 lb/hr	0.054 lb/hr	0.63 lb/hr	Yes
PM _{2.5} ^d annual	3.9 ton/yr	0.35 ton/yr	4.1 ton/yr	Yes
PM ₁₀ ^e 24-hour	4.8 lb/hr	0.22 lb/hr	2.6 lb/hr	Yes
NO _x ^f 1-hour	20.4 lb/hr	0.20 lb/hr	2.4 lb/hr	Yes
SO ₂ ^g 1-hour	31.2 lb/hr	0.21 lb/hr	2.5 lb/hr	Yes
CO ^h 1-hour, 8-hour	45.5 lb/hr	15 lb/hr	175 lb/hr	No ⁱ

a. Emission rate in either pounds/hour (lb/hr) over the specified time period or ton/year (ton/yr) over the specified time period.

b. Level I Modeling Applicability Thresholds are unconditional.

c. Level II Modeling Applicability Thresholds require DEQ approval and approval is dependent on the use of parameters that would result in dispersion as good or better than parameters in modeling analyses used to generate Level II thresholds. DEQ determined Level II thresholds are not appropriate for PM_{2.5} and PM₁₀ emissions.

d. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

e. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

f. Nitrogen oxides.

g. Sulfur dioxide

h. Carbon dioxide

i. DEQ determined Level II thresholds were appropriate for this pollutant.

Ozone (O₃) differs from other criteria pollutants in that it is not typically emitted directly into the atmosphere. O₃ is formed in the atmosphere through reactions of VOCs, NO_x, and sunlight. Atmospheric dispersion models used in stationary source air permitting analyses (see Section 3.3.3) cannot be used to estimate O₃ impacts resulting from VOC and NO_x emissions from an industrial facility. O₃ concentrations resulting from area-wide emissions are predicted by using more complex airshed models such as the Community Multi-Scale Air Quality (CMAQ) modeling system. Use of the CMAQ model is very resource intensive and DEQ asserts that performing a CMAQ analysis for a particular permit application is not typically a reasonable or necessary requirement for air quality permitting.

Addressing secondary formation of O₃ has been somewhat addressed in EPA regulation and policy. As stated in a letter from Gina McCarthy of EPA to Robert Ukeiley, acting on behalf of the Sierra Club (letter from Gina McCarthy, Assistant Administrator, United States Environmental Protection Agency, to Robert Ukeiley, January 4, 2012):

... footnote 1 to sections 51.166(I)(5)(I) of the EPA's regulations says the following: "No de minimis air quality level is provided for ozone. However, any net emission increase of 100 tons per year or more of volatile organic compounds or nitrogen oxides subject to PSD would be required to perform an ambient impact analysis, including the gathering of air quality data."

The EPA believes it unlikely a source emitting below these levels would contribute to such a violation of the 8-hour ozone NAAQS, but consultation with an EPA Regional Office should still be conducted in accordance with section 5.2.1.c. of Appendix W when reviewing an application for sources with emissions of these ozone precursors below 100 TPY."

Allowable emissions estimates of VOCs and NO_x are below the 100 tons/year threshold, and DEQ determined it was not appropriate or necessary to require a quantitative source specific O₃ impact analysis.

Secondary Particulate Formation

The impact from secondary particulate formation resulting from emissions of NO_x, SO₂, and/or VOCs was assumed by DEQ to be negligible on the basis of the magnitude of emissions and the short distance from emissions sources to modeled receptors where maximum PM₁₀ and PM_{2.5} impacts would be anticipated.

3.1.2 Toxic Air Pollutant Emissions Rates

TAP emissions regulations under Idaho Air Rules Section 220 are only applicable for new or modified sources constructed after July 1, 1995. Table 6 lists emission rates used in the TAP impact analyses performed for those TAPs with potential emissions exceeding the TAP-specific ELs. Polyaromatic hydrocarbons (PAHs) are regulated by DEQ on an individual compound basis rather than a collective impact of all PAH compounds. Emissions of the PAH naphthalene are far greater than any other PAHs. Therefore, impacts of naphthalene are likely greater than other PAHs and demonstrating compliance of naphthalene with the PAH AACC will assure compliance with the other PAHs without the need to extensively model those PAHs.

Table 6. TAP EMISSIONS USED IN DEQ ANALYSES					
TAP	Averaging Period^a	Emissions (lb/hr)^b			
		DRYER^c	HOTOIL^d	SILOFILL^e	LOAD^f
Acetaldehyde	Annual	7.21 E-2	0.0	0.0	0.0
Benzene	Annual	2.16 E-2	8.44 E-7	2.16 E-4	1.200 E-4
Formaldehyde	Annual	1.720 E-1	3.01 E-5	4.67 E-3	2.03 E-4
POM ^g	Annual	3.04 E-5	4.58 E-9	3.75 E-5	2.55 E-5
Arsenic	Annual	3.11 E-5	8.04 E-8	0.0	0.0
Cadmium	Annual	2.28 E-5	4.42 E-7	0.0	0.0
Chromium 6+	Annual	2.50 E-5	0.0	0.0	0.0
Nickle	Annual	3.50 E-3	0.0	0.0	0.0
PAH compounds^h					
Naphthalene	Annual	3.61 E-2	2.45 E-7	2.56 E-4	2.36 E-4
2-Methylnaphthalene	Annual	9.43 E-3	9.64 E-9	7.43 E-4	4.50 E-4
Acenaphthene	Annual	7.77 E-5	7.23 E-10	6.62 E-5	4.92 E-5
Acenaphthylene	Annual	1.221 E-3	7.23 E-10	1.973 E-6	5.30 E-6
Anthracene	Annual	1.720 E-4	9.64 E-10	1.832 E-5	1.324 E-5
Fluorene	Annual	6.10 E-4	1.125 E-10	1.423 E-4	1.457 E-4
Phenanthrene	Annual	1.276 E-4	6.83 E-9	2.54 E-4	1.533 E-4
Pyrene	Annual	1.665 E-4	2.01 E-9	6.20 E-5	2.84 E-5

- a. Maximum annual emissions are used for carcinogenic TAPs listed in Idaho Air Rules Section 586, and maximum 24-hour emissions are used for noncarcinogenic TAPs listed in Idaho Air Rules Section 585.
- b. Maximum emissions for the averaging period of the TAP increment, expressed as pounds/hour. Pound/hour rates for annual averages were calculated by dividing the annual emissions by 5,856 hour/year of operation.
- c. Drum dryer.
- d. Asphalt oil heater.
- e. Loading of asphalt storage silo.
- f. Asphalt loadout from storage silo. These emissions are captured and routed back to the drum dryer. Jacobs analyses disregarded these emissions while DEQ's analyses added these emissions to those of the drum dryer.
- g. Polycyclic Organic Matter consisting of a group of seven polyaromatic hydrocarbons (PAHs) as listed in Idaho Air Rules Section 586.
- h. Polyaromatic hydrocarbons. PAHs are regulated on an individual PAH basis with the impact of each separate PAH compared to the PAH EL or AACC.

3.1.3 Emissions Release Parameters

Table 7 provides emission release parameters for the HMA plant used in the analyses, including stack height, stack diameter, exhaust temperature, and exhaust velocity. Additional details are provided in Attachment 1.

The HMA plant is a portable facility. The spatial configuration of equipment and emission source release points will vary from site-to-site depending on characteristics of the site and specific product needs. To generate a reasonably conservative assessment of air impacts in the dispersion model, emission sources were positioned in a tight grouping centered on the drum dryer stack (sources located within 7.0 and 9.0 meters of the stack).

Asphalt silo filling emissions are captured and routed back to the drum dryer. Asphalt loadout emissions were modeled as a point source, rather than a volume source, to account for thermal buoyancy of the emissions plume. Release parameters for asphalt loadout were based on the following:

- The release point of asphalt loadout operations was set at 3.5 meters to correspond to the top of a truck bed.

- Stack diameter of 3.0 meters was used to approximately correspond to a typical silo. Model-calculated stack tip downwash will account for downwash affects potentially caused by the silo.
- Stack gas temperature of 346K was calculated by assuming the gas temperature would be half that of the default asphalt temperature of 325°F (1/2 of 325° F = 163° F = 346 K).
- Flow velocity of 0.1 m/sec was used to establish a reasonably conservative total flow from the source of 1,500 actual cubic feet per minute, caused by convection.

Fugitive sources of aggregate handling and screening were modeled as volume sources. The initial horizontal and vertical dispersion coefficients were calculated using methods outlined in the *User's Guide for the AMS/EPA Regulatory Model – AERMOD*.³

Table 7. HMA PLANT EMISSION RELEASE PARAMETERS

Release Point /Location	Source Type	Model Coordinates		Stack Height (meters) ^a	Modeled Diameter (meters) ^a	Stack Gas Temp. (K) ^b	Stack Gas Flow Velocity (m/sec) ^c
		X (meters)	Y (meters)				
DRYER	Point	0.0	0.0	11.0 (36 ft)	1.15 (3.8 ft)	389 (241 °F)	22.4 (73 fps)
HOTOIL	Point	-5.0	-5.0	4.6 (15 ft)	0.26 (0.85 ft)	339 (150 °F)	1.32 (4.3 fps)
LOAD	Point	-5.0	-5.0	3.5 (11.5 ft)	3.0 (9.8 ft)	346 (163 °F)	0.10 (0.33 fps)
GEN1	Point	4.57	7.35	6.1 (20 ft)	0.20 (0.67 ft)	440 (332 °F)	29.8 (97.9 fps)
GEN2	Point	4.52	-7.43	6.1 (20 ft)	0.20 (0.67 ft)	440 (332 °F)	29.8 (97.9 fps)
Volume Sources							
Release Point /Location	Source Type	Model Coordinates		Release Height (m) ^a	Initial Horizontal Dispersion Coefficient σ_{y0} (m)	Initial Vertical Dispersion Coefficient σ_{z0} (m)	
		X (meters)	Y (meters)				
LOADCONV	Volume	0.0	0.0	2.5 (8.2)	4.65	1.16	
SCREEN	Volume	-5.0	5.0	3.0 (9.8)	0.93	2.33	

^a. Values in parentheses are in feet.

^b. Kelvin. Values in parentheses are in degrees Fahrenheit.

^c. Meters per second. Values in parentheses are in feet/second.

3.2 Background Concentrations

Background concentrations are used if a cumulative NAAQS impact analysis is needed to demonstrate compliance with applicable NAAQS. A background concentration tool was used to establish ambient air background concentrations for this project. The design value (DV) background concentration tool is accessed from the Northwest International Air Quality Environmental Science and Technology Consortium (NW AIRQUEST: <https://arcg.is/1jXmHH>) using the location-specific coordinates. These background air pollutant levels are based on regional-scale air impact modeling of criteria pollutants in Washington, Oregon, and Idaho. The modeling was performed for years 2014-2017 using updated air pollutant emissions inventories. Modeled background values were adjusted by the tool according to available ambient monitoring data and improved interpolation techniques.

DEQ used the background concentration tool to determine DV concentrations at the following locations: Boise, Nampa, Coeur d'Alene, McCall, St. Maries, Pocatello, Soda Springs, Payette, Kamiah, Rathdrum,

Lewiston, Grangeville, Star, Twin Falls, Blackfoot, Plummer, Sandpoint, Kamiah, Idaho Falls, Burley, Caldwell, and Mountain Home. The statewide background concentration for each pollutant and applicable averaging period was then determined by using the mean of all locations plus the standard deviation.

The applicable DV background concentrations for these impact analyses are listed in Table 8.

Table 8. AMBIENT BACKGROUND CONCENTRATIONS AT THE LINKONE FACILITY.		
Pollutant	Averaging Period	Background Concentration ($\mu\text{g}/\text{m}^3$)^{a,b}
PM _{2.5} ^c	24-hour	27.0
	Annual	7.94
PM ₁₀ ^d	24-hour	93.1
NO ₂ ^e	1-hour	71.3 (37.9 ppb ^f)
SO ₂ ^g	1-hour	38.6 (19.7 ppb ^f)

- a. Micrograms per cubic meter, except where noted otherwise.
- b. NW AIRQUEST ambient background lookup tool, 2014-2017.
- c. Particulate matter with an aerodynamic diameter of 2.5 microns or less.
- d. Particulate matter with an aerodynamic diameter of 10 microns or less.
- e. Nitrogen dioxide.
- f. Parts per billion by volume.
- g. Sulfur dioxide.

3.3 Impact Modeling Methodology

This section describes the modeling methods used by DEQ to demonstrate preconstruction compliance with applicable air quality standards.

3.3.1 General Overview of Analyses

Jacobs performed the project-specific air pollutant emissions inventory (based on DEQ’s HMA plant emission calculation spreadsheet) and air impact analyses (based on DEQ’s procedures used for assessing pollutant impacts from HMA plants). DEQ reviewed the data, methods, and analyses submitted with the application and performed verification air impact modeling. The submitted information/analyses, in combination with results from DEQ’s air impact analyses, demonstrate compliance with applicable air quality standards to DEQ’s satisfaction, provided the facility is operated as described in the submitted application and in this memorandum.

The Knife River HMA plant is a portable facility that may locate anywhere within Idaho. Therefore, site-specific data/characteristics used in air impact analyses, such as meteorological data, site layout, and terrain, cannot be represented as accurately as can be achieved for one fixed site. This increases the uncertainty in analytical results. DEQ used several methods to account for and offset this increased uncertainty, and these methods are described in subsequent sections of this memorandum. The general method used for portable sources was the following:

1. Use a polar receptor grid with the emission points located at the center in a conservatively tight grouping.
2. Run the model for numerous meteorological datasets, collected throughout Idaho.

3. For each model run and pollutant, identify the controlling receptor. The controlling receptor is the one just beyond (further from the emission points) the most distant receptor showing a concentration value over the applicable standard when combined with the DV background level.
4. Determine the distance between the controlling receptor and the drum dryer emission point for each model run.
5. The minimum setback requirement distance is the furthest distance between the controlling receptor and key emission points (the drum dryer and stacks of the IC engines), considering all model runs.
6. Compliance with identified applicable standards is assured provided the HMA plant operates as described and the minimum setback between emission sources and the nearest point of ambient air is maintained.

Setback distances were calculated for possible scenarios involving two operational options: 1) operations with diesel-fired generators to supply electrical power; 2) operations without generators.

DEQ's air impact analyses were based on the HMA plant potentially operating at a given site permanently and assumes seasonal operation, with no operations between December 1 and March 31.

Table 9 provides a brief description of parameters used in the modeling analyses.

Table 9. MODELING PARAMETERS		
Parameter	Description/Values	Documentation/Addition Description
General Facility Location	Portable in Idaho	Air impact modeling was performed to determine a setback distance needed between emission sources and the nearest point of ambient air for any location where the HMA plant may locate. The HMA plant may not locate within NAAQS non-attainment areas.
Model	AERMOD	AERMOD with the PRIME downwash algorithm, version 19191.
Meteorological Data	Multiple Areas	See Section 3.3.5 of this memorandum for additional details of the meteorological data.
Terrain	Not Considered	Flat terrain was assumed in the analyses.
Building Downwash	Considered	BPIP-PRIME was used to evaluate building/structure dimensions for consideration of downwash effects in AERMOD.
NOx chemistry	ARM2	NO to NO ₂ conversion was addressed using the ARM2 method with default NO ₂ /NOx ratios (see Section 3.3.4).
Receptor Grid	Polar Grid	Adequate to resolve maximum modeled impacts.

3.3.2 Modeling protocol and Methodology

A modeling protocol was not submitted to DEQ prior to the application because DEQ performed the required air impact analyses. Site-specific modeling was generally conducted using data and methods described in the *State of Idaho Air Quality Modeling Guideline*.²

3.3.3 Model Selection

Idaho Air Rules Section 202.02 requires that estimates of ambient concentrations be based on air quality models specified in 40 CFR 51, Appendix W (Guideline on Air Quality Models). The refined, steady state, multiple source, Gaussian dispersion model AERMOD was promulgated as the replacement model for ISCST3 in December 2005. AERMOD retains the single straight-line trajectory of ISCST3, but

includes more advanced algorithms to assess turbulent mixing processes in the planetary boundary layer for both convective and stable stratified layers.

AERMOD version 19191 was used for the modeling analyses to evaluate impacts of the facility. This version was the current version at the time the application was received by DEQ.

3.3.4 Data and Parameters used for Modeling 1-Hour NO₂ with ARM2

The atmospheric chemistry of NO, NO₂, and O₃ complicates accurate prediction of NO₂ impacts resulting from NO_x emissions. The conversion of NO to NO₂ can be conservatively addressed through the use of several methods as outlined in a 2014 EPA NO₂ Modeling Clarification Memorandum.⁴ The guidance outlines a three-tiered approach:

- Tier 1 – assume full conversion of NO to NO₂ where total NO_x emissions are modeled and modeled impacts are assumed to be 100 percent NO₂.
- Tier 2 – use an ambient ratio to adjust impacts from the Tier 1 analysis.
- Tier 3 – use a detailed screening method to account for NO/NO₂/O₃ chemistry such as the Ozone Limiting Method (OLM) or the Plume Volume Molar Ratio Method (PVMRM).

DEQ used the Ambient Ratio Method 2 (ARM2) method, a Tier 2 analysis method which assumes an ambient equilibrium between NO and NO₂, in which the conversion of NO to NO₂ is predicted using hourly ambient NO_x monitoring data. ARM2 has been adopted by the EPA as a default regulatory Tier 2 option. A minimum and maximum NO₂/NO_x ratio of 0.5 and 0.9, respectively, were specified in the model.

3.3.5 Meteorological Data

DEQ air impact analyses used processed meteorological data from numerous locations throughout Idaho. DEQ determined that NAAQS compliance is reasonably assured for all areas of Idaho when compliance is demonstrated by multiple analyses using the following 20 meteorological datasets: Boise, Coeur d'Alene, Grangeville, Twin Falls, Pocatello (DEQ tower in the downtown area), Pocatello airport, Idaho Falls, Rexburg, Burley, Lewiston, McCall, Spokane, Challis, Pullman/Moscow, Jerome, INL, Mountain Home, Soda Springs, Bonners Ferry, and Sandpoint. All data were processed using the option in AERMET to adjust the surface friction velocity (u*) to address AERMOD's tendency to over-predict concentrations from some sources under stable, low wind speed conditions.

3.3.6 Effects of Terrain on Modeled Impacts

Terrain effects on dispersion were not considered in the non-site-specific analyses. DEQ contends that assuming flat terrain is not a critical limitation of the analyses because most emission points associated with HMA plants are near ground-level and the immediate surrounding area is typically flat for dispersion modeling purposes. Emissions sources near ground-level typically have maximum pollutant impacts near the source, minimizing the potential effect of surrounding terrain to influence the magnitude of maximum modeled impacts. Also, other conservative assumptions and data used in the analyses will offset the potential underestimation of impacts to elevated terrain.

3.3.7 Facility Layout

DEQ's analyses for portable HMA plants use a conservative generic facility layout. This is done because the specific layout will vary depending on product needs and specific characteristics of the site and equipment. To provide conservative results, DEQ uses a tight grouping of emissions sources. Sources are positioned within 7 meters of the center of the facility. The drum dryer stack is placed at the center of the facility and the center of the polar grid. Table 7 lists the emission point configuration used in the impact modeling analyses.

3.3.8 Effects of Building Downwash on Modeled Impacts

The housing of the large generator was assessed for potential plume downwash effects, modeled as a 13-foot (4-meter) by 6.6-foot (2.0-meter) structure, 5.0 feet (1.5-meters) high. The structure was positioned to encompass both generators. No other substantial structures were identified in the application. Downwash effects from equipment or other minor structures at the site were not accounted for because much of the equipment is porous to wind, thereby minimizing downwash effects.

3.3.9 Ambient Air Boundary

Ambient air is defined in Section 006 of the Idaho Air Rules as "that portion of the atmosphere, external to buildings, to which the general public has access." Ambient air is typically considered areas external to the identified property boundary where the facility is located, assuming that reasonable measures will be taken to preclude public access.

DEQ's non-site-specific analysis methods, using a generic facility layout, were used to generate minimum setback distances between key emissions points and the property boundary or the established boundary to ambient air (if not the same as the property boundary). Setback distances were specified as the distance between the drum dryer stack and the closest point of potential public access. Compliance with applicable air quality standards and increments is not demonstrated unless setback distances are maintained.

3.3.10 Receptor Network

The polar grid included a total of over 3,000 receptors, provided good resolution of the maximum design value concentrations for the project, and provided extensive coverage. DEQ determined that the receptor grid used in the analyses was adequate to resolve maximum modeled impacts.

The receptor grid used in the impact modeling analyses met the minimum recommendations specified in the *Idaho Air Quality Modeling Guideline*², and DEQ determined that the receptor network was effective in determining setback distances needed to reasonably assure compliance with applicable air quality standards at all ambient air locations.

3.3.11 Crucial HMA Plant Characteristics Affecting Air Quality Impacts

Table 10 lists characteristics of the HMA plant that are critical to the NAAQS and TAPs compliance demonstrations.

Table 10. IMPORTANT CHARACTERISTIC OF HMA PLANT USED IN DEQ ANALYSES

Parameter	Value or Description
HMA Plant	
HMA Throughput Rates	350 ton/hr, 4,000 ton/day, 325,000 ton/yr
IC Engines Powering Generators	Two 670 bhp EPA Tier 4 certified diesel engines operating a maximum of 13 hours/day and 1,161 hours/year.
Co-Contributing Sources	Analyses assumed there were no co-contributing emission sources within 1,000 ft of the HMA plant (distances determined from the drum dryer stack). The HMA plant will not move to a location within 1,000 ft of another permitted facility, including a CBP, rock crushing plant, or another HMA plant (see Table 1 and Section 4.2 for more details). Also, other permitted plants will not be brought onto the permittee's site within 1,000 ft of the HMA.
Drum Dryer	Drum dryer fueled by natural gas, propane, diesel, or residual fuel oil (RFO) with a baghouse for emissions control.
Dryer Stack Parameters	Stack height ≥ 36 ft, stack diameter ≈ 3.8 ft (effective diameter), gas temp $\geq 240^\circ$ F, flow velocity ≥ 73 ft/sec.
IC Engine Stack Parameters	Stack height ≥ 20 ft, stack diameter ≈ 0.7 ft, gas temp $\geq 332^\circ$ F, flow velocity ≥ 30 ft/sec.
Asphalt Silo Filling	It was assumed that emissions are not captured and routed back to the drum dryer.
Conveyor Transfers	≤ 3 transfers for any given quantity of material processed. Emissions controlled by 90%.
Scalping Screen	≤ 1 screen for any given quantity of material processed. Emissions controlled by 90%.
Frontend Loader Transfers	≤ 2 transfers for any given quantity of material processed. Typically involves: 1) aggregate to storage pile; 2) aggregate from pile to hopper.
Portability	The HMA plant was modeled as permanent source, potentially remaining at any location for more than 12 months, with the ability to locate at any location in Idaho that is not a non-attainment area.
Seasonal Restriction	No operations from December 1 through March 31.

4.0 Impact Modeling Results

4.1 Results for NAAQS Cumulative Impact and TAP Analyses

DEQ determined required setback distances from the non-site-specific modeling results for each proposed operating scenario, criteria pollutant and TAP, and averaging period. Table 11 lists controlling setback distances for each operational scenario. Setback distances are the closest allowable distance between the property boundary and the center of the facility, which is taken to be the drum dryer stack location. Attachment 2 provides calculated setback distances for individual impact analyses.

HMA Configuration Scenario	Setback (feet (meters))	Controlling Pollutant
350 ton HMA/hour, 4,000 ton HMA/day, 325,000 ton HMA/year, operation with or without IC engine powering a generator.	459 (140)	1-hr SO ₂ , 24-hr PM _{2.5} ^a , 24-hr PM ₁₀ ^b

^a. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

^b. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

4.2 Locating with Other Facilities/Equipment

The air impact analyses performed by DEQ assume there are no other emissions sources in the immediate area that measurably contribute to pollutant concentrations in a way not adequately accounted for by the background concentrations used. Such emissions sources could include a rock crushing plant, another HMA plant, a ready-mix CBP, or other permitted facility. DEQ modeling staff established a rule-of-thumb distance of 1,000 feet from emissions sources at the HMA plant where emissions from a nearby source/facility must be considered in the air impact analyses for the HMA plant. Emissions sources located beyond 1,000 feet are considered to too distant to have a measurable impact on receptors substantially impacted by the HMA plant.

HMA plants commonly co-locate with rock crushing plants. Since the short-term impacts are often the governing criteria, simultaneously operation on an annual basis is not a large concern. DEQ modeling staff determined NAAQS compliance is still assured when a rock crushing plant locates with the HMA plant, provided the HMA plant does not operate during any day when the rock crushing plant is operating and the annual actual throughput of the rock crushing plant is not greater than 500,000 tons. DEQ modeling staff also determined NAAQS compliance is assured when operating the HMA plant during the same day as the rock crushing plant, provided the throughput of the HMA plant for that day is half that assumed for the modeling analyses used to generate setback distances.

Once the HMA plant is established at a site, the plant has no control over other facilities locating on neighboring properties (this does not include facilities locating on the same property as the HMA plant). Cumulative impacts would be assessed in the permitting analyses performed for the neighboring facility. The 1,000-foot restriction assumption on off-property co-contributing sources only applies when the HMA plant is relocating to a new site.

5.0 Conclusions

The ambient air impact analyses and other air quality analyses performed in support of the PTC application demonstrated to DEQ's satisfaction that emissions from the Knife River HMA plant as described in this memorandum will not cause or significantly contribute to a violation of any ambient air quality standard.

References

1. *Policy on NAAQS Compliance Demonstration Requirements*. Idaho Department of Environmental Quality Policy Memorandum. July 11, 2014.
2. *State of Idaho Guideline for Performing Air Quality Impact Analyses*. Idaho Department of Environmental Quality. September 2013. State of Idaho DEQ Air Doc. ID AQ-011. Available at <http://www.deq.idaho.gov/media/1029/modeling-guideline.pdf>.
3. *User's Guide for the AMS/EPA Regulatory Model – AERMOD*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emissions Monitoring and Analysis Division. EPA-454/B-03-001. September 2004. (Section 3.3.2.2).
4. *Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO₂ National Ambient Air Quality Standard*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Modeling Group. Memorandum from R. Chris Owen and Roger Brode, to Regional Dispersion Modeling Contacts. September 30, 2014.

ATTACHMENT 1

EMISSIONS CALCULATIONS AND MODELING PARAMETERS FOR

DEQ'S AIR IMPACT ANALYSES

HMA Plant Modeled Emissions Rates

Compliance determination is linked to throughput levels and the equipment configuration at the site.

Emissions from Drum Dryer, Asphalt Loadout, Asphalt Silo Filling, and Asphalt Tank Heater

DEQ's HMA plant spreadsheet to calculate emissions rates for various averaging periods.

Aggregate Handling Emissions

Emissions from aggregate handling were calculated for the following transfers: 1) aggregate to a storage pile by frontend loader; 2) aggregate from a pile to a hopper by frontend loader; 3) three conveyor transfers.

PM₁₀ and PM_{2.5} emissions associated with the handling of aggregate materials were calculated using emissions factors from AP42 Section 13.2.4.

Emissions were calculated using the following emissions equation:

$$E = k(0.0032) \left[\frac{(U/5)^{1.3}}{(M/2)^{1.4}} \right] \text{ lb/ton}$$

Where:

- k = 0.053 for PM_{2.5}, 0.35 for PM₁₀
- M = 3% for aggregate
- U = wind speed (mph)

A moisture content of 3% to 7% was estimated as a typical moisture content of aggregate entering the dryer, per STAPPA-ALAPCO-EPA, Emission Inventory Improvement Program, Volume II, Chapter 3, Preferred and Alternative Methods for Estimating Air Emissions from Hot Mix Asphalt Plants, Final Report, July 1996. An additional 90% emissions control was applied to calculated emissions from the conveyor transfers to account for additional emissions control measures required by Idaho regulations and the permit.

In the model, emissions are varied as a function of windspeed, with the base emissions entered for a windspeed of 10 mph.

upper windspeeds for 6 categories: 1.54, 3.09, 5.14, 8.23, 10.8 m/sec

Median windspeed for each category (1 m/sec = 2.237 mph)

- Cat 1: (0 + 1.54)/2 = 0.77 m/sec > 1.72 mph
- Cat 2: (1.54 + 3.09)/2 = 2.32 m/sec > 5.18 mph
- Cat 3: (3.09 + 5.14)/2 = 4.12 m/sec > 9.20 mph
- Cat 4: (5.14 + 8.23)/2 = 6.69 m/sec > 14.95 mph
- Cat 5: (8.23 + 10.8)/2 = 9.52 m/sec > 21.28 mph
- Cat 6: (10.8 + 14)/2 = 12.4 m/sec > 27.74 mph

Base PM_{2.5} factor – use 10 mph wind: $0.053 (0.0032) \frac{(10/5)^{1.3}}{(3/2)^{1.4}} = 2.367 \text{ E-4 lb/ton}$

Adjustment factors to put in the model:

$$\text{Cat 1: } (1.72/5)^{1.3} (9.614 \text{ E-5}) = 2.401 \text{ E-5 lb/ton}$$

$$\text{Factor} = 2.401 \text{ E-5} / 2.367 \text{ E-4} = 0.1014$$

$$\text{Cat 2: } (5.18/5)^{1.3} (9.614 \text{ E-5}) = 1.007 \text{ E-4 lb/ton}$$

$$\text{Factor} = 1.007 \text{ E-4} / 2.367 \text{ E-4} = 0.4253$$

$$\text{Cat 3: } (9.20/5)^{1.3} (9.614 \text{ E-5}) = 2.124 \text{ E-4 lb/ton}$$

$$\text{Factor} = 2.124 \text{ E-4} / 2.367 \text{ E-4} = 0.8974$$

$$\text{Cat 4: } (14.95/5)^{1.3} (9.614 \text{ E-5}) = 3.993 \text{ E-4 lb/ton}$$

$$\text{Factor} = 3.993 \text{ E-4} / 2.367 \text{ E-4} = 1.687$$

$$\text{Cat 5: } (21.28/5)^{1.3} (9.614 \text{ E-5}) = 6.318 \text{ E-4 lb/ton}$$

$$\text{Factor} = 6.318 \text{ E-4} / 2.367 \text{ E-4} = 2.669$$

$$\text{Cat 6: } (27.74/5)^{1.3} (9.614 \text{ E-5}) = 8.918 \text{ E-4 lb/ton}$$

$$\text{Factor} = 8.918 \text{ E-4} / 2.367 \text{ E-4} = 3.768$$

For the operational scenario for 4,000 ton/day HMA and 325,000 ton/year HMA, emissions from the loader are as follows (daily and annual throughputs were based on aggregate being 96% of the total HMA production):

Daily PM_{2.5}:

$$\frac{2.367 \text{ E-4 lb PM}_{2.5}}{\text{Ton}} \left| \frac{3,840 \text{ ton}}{\text{day}} \right| \frac{\text{day}}{24 \text{ hour}} \left| \frac{2 \text{ transfers}}{\text{hour}} \right| = \frac{0.07574 \text{ lb}}{\text{hour}}$$

Annual PM_{2.5}:

$$\frac{2.367 \text{ E-4 lb PM}_{2.5}}{\text{Ton}} \left| \frac{312,000 \text{ ton}}{\text{year}} \right| \frac{\text{year}}{5,856 \text{ hour}} \left| \frac{2 \text{ transfers}}{\text{hour}} \right| = \frac{0.02522 \text{ lb}}{\text{hour}}$$

Emissions from the three conveyor transfers are as follows (with an additional 90% control):

Daily PM_{2.5}:

$$\frac{2.367 \text{ E-4 lb PM}_{2.5}}{\text{Ton}} \left| \frac{3,840 \text{ ton}}{\text{day}} \right| \frac{\text{day}}{24 \text{ hour}} \left| \frac{3 \text{ transfers}}{\text{hour}} \right| (1-0.90) = \frac{0.01136 \text{ lb}}{\text{hour}}$$

Annual PM_{2.5}:

$$\frac{2.367 \text{ E-4 lb PM}_{2.5}}{\text{ton}} \left| \frac{312,000 \text{ ton}}{\text{year}} \right| \frac{\text{year}}{5,856 \text{ hour}} \left| \frac{3 \text{ transfers}}{\text{hour}} \right| (1-0.90) = \frac{0.003783 \text{ lb}}{\text{hour}}$$

Total aggregate handling emissions:

$$\text{Daily PM}_{2.5}: 0.07574 \text{ lb/hr} + 0.01136 \text{ lb/hr} = 0.08710 \text{ lb/hr}$$

$$\text{Annual PM}_{2.5}: 0.02522 \text{ lb/hr} + 0.003783 \text{ lb/hr} = 0.02900 \text{ lb/hr}$$

Screening Emissions

This HMA plant uses one scalping screen. A PM_{2.5} factor for uncontrolled emissions was not available in AP42. A PM_{2.5} factor was estimated by DEQ permit writers and entered into the HMA calculation spreadsheet. The uncontrolled emissions factor was used and a 15% reduction applied to calculated emissions to account for additional emissions control measures required by Idaho regulations and the permit.

Daily and annual throughputs were based on aggregate being 96% of the total HMA production.

For the operational scenario for 3,000 ton/day HMA and 300,000 ton/year HMA, emissions are as follows:

Scalping Screen (controlled emissions):

Daily PM_{2.5}:

$$\frac{0.000130 \text{ lb PM}_{10}}{\text{ton}} \left| \frac{3,840 \text{ ton}}{\text{day}} \right| \left| \frac{\text{day}}{24 \text{ hour}} \right| (1-0.90) = \frac{0.002080 \text{ lb}}{\text{hour}}$$

Annual PM_{2.5}:

$$\frac{0.000130 \text{ lb PM}_{10}}{\text{ton}} \left| \frac{312,000 \text{ ton}}{\text{year}} \right| \left| \frac{\text{year}}{5,856 \text{ hour}} \right| (1-0.90) = \frac{0.0006926 \text{ lb}}{\text{hour}}$$

HMA Plant Modeling Parameters

Dryer baghouse Stack

Release height = 11.0 meters; effective diameter of release area = 1.2 meters;
typical stack gas temperature = 389 K; typical flow velocity = 22.4 meters/second

Asphalt Silo Filling

Emissions are captured and routed back to the drum dryer.

Asphalt Loadout

DEQ modeled this source as a point source.

- release height of 3.5 meters
- stack diameter of 3 meters, corresponding to the approximate diameter of the silo.
- gas temperature was estimated at half the AP42 default asphalt temperature: $325^{\circ} \text{ F} / 2 = 163^{\circ} \text{ F}$ (346 K)
- stack velocity of 0.1 m/sec to account for convective air flow.

Aggregate to and from Storage and Conveyor Transfers

Release emissions in model from a 20 m X 20 m area 5 m high, released at 2.5 m

Initial dispersion coefficients:

$$\sigma_{y0} = 20 \text{ m} / 4.3 = 4.65 \text{ m}$$

$$\sigma_{z0} = 5 \text{ m} / 4.3 = 1.16 \text{ m}$$

Sources include: five transfers, equivalent in emissions to that of a frontend loader, from the point of aggregate delivery to transfer to the HMA plant hopper, and three conveyor transfers.

Scalping Screen

This source was modeled as a single volume source on or adjacent to a structure 5 m X 4 m, 5.0 meters thick, with a release height of 3.0 meters. The initial dispersion coefficients are calculated as follows:

$$\sigma_{y0} = 4 \text{ m} / 4.3 = 0.93 \text{ m}$$

$$\sigma_{z0} = 5 \text{ m} / 2.15 = 2.33 \text{ m}$$

Generator Engines

Stack parameters for both engines are identical (GEN1 and GEN2): = Release height = 6.1 meters; effective diameter of release area = 0.20 meters; typical stack gas temperature = 440 K; typical flow velocity = 29.8 meters/second

Stack gas temperatures and flow rates are often overestimated by permit applicants, likely because values reported by manufacturers are often based on values measured at the exhaust manifold rather than at the point of release to the atmosphere. Jacobs indicated that stack parameters were obtained from the supplier's performance datasheets, using a 75 percent load. The values appeared conservative based on the source.

ATTACHMENT 2
CALCULATED SETBACK DISTANCES FOR
DEQ'S AIR IMPACT ANALYSES

Required Setback Distances for Specific Pollutants, Averaging Periods, and Meteorological Datasets		
Meteorological Data	Setback (m)	
NO₂ 1-hour Modeling Results	350 ton/hr production, Operations with engines^a	350 ton/hr production, Operations without engines^b
Boise	<50 - H8thH = 149.2 µg/m ³	<50
Burley	<50 - H8thH = 168.5 µg/m ³	<50
Coeur d'Alene	<50 - H8thH = 174.3 µg/m ³ (<50 - 165 µg/m ³)	<50
Challis	<50 - H8thH = 151.2 µg/m ³	<50
Grangeville	<50 - H8thH = 160.6 µg/m ³	<50
Idaho Falls	<50 - H8thH = 165.5 µg/m ³	<50
INL/Grid3 Mesowest site	<50 - H8thH = 181.7 µg/m ³ (<50 - 181 µg/m ³)	<50
Jerome	<50 - H8thH = 167.7 µg/m ³ (<50 - 178 µg/m ³)	<50
Lewiston	<50 - H8thH = 145.3 µg/m ³	<50
McCall	<50 - H8thH = 161.6 µg/m ³	<50
Moscow	<50 - H8thH = 164.5 µg/m ³	<50
Mountain Home	<50 - H8thH = 178.0 µg/m ³ (<50 - 178 µg/m ³)	<50
Pocatello (DEQ tower)	<50 - H8thH = 187.7 µg/m ³ (<50 - 188 µg/m ³)	<50
Pocatello Airport	<50 - H8thH = 171.1 µg/m ³	<50
Rexburg	<50 - H8thH = 160.9 µg/m ³	<50
Sandpoint	<50 - H8thH = 165.3 µg/m ³	<50
Soda Springs (P4 Rambol data)	<50 - H8thH = 173.5 µg/m ³	<50
Spokane	<50 - H8thH = 162.6 µg/m ³	<50
Twin Falls	<50 - H8thH = 167.4 µg/m ³	<50

SO₂ 1-hour Modeling Results^a	350 ton/hr production, Operations with engines^b	350 ton/hr production, Operations with engines^b
Boise	<50 - H4thH = 168.4 µg/m ³ (<50 - 169 µg/m ³)	<50
Bonniers Ferry	(105 µg/m ³)	(<50)
Burley	<50 - H4thH = 134.4 µg/m ³ (<50 - 135 µg/m ³)	<50
Coeur d'Alene	<50 - H4thH = 131.7 µg/m ³	<50
Challis	<50 - H4thH = 139.7 µg/m ³	<50
Grangeville	<50 - H4thH = 181.5 µg/m ³ (<50 - 182 µg/m ³)	<50
Idaho Falls	<50 - H4thH = 190.1 µg/m ³	<50
INL/Grid3 Mesowest site	135 (135)	135
Jerome	<50 - H4thH = 189.1 µg/m ³	<50
Lewiston	<50 - H4thH = 142.8 µg/m ³	<50
McCall	105	105
Moscow	<50 - H4thH = 164.8 µg/m ³	<50
Mountain Home	140 (140)	140
Pocatello (DEQ tower)	130 (130)	130
Pocatello Airport	125	125
Rexburg	<50 - H4thH = 170.9 µg/m ³	<50
Sandpoint	<50 - H4thH = 124.5 µg/m ³	<50
Soda Springs (P4 Rambol data)	130 (130)	130
Spokane	<50 - H4thH = 145.2 µg/m ³	<50
Twin Falls	<50 - H4thH = 191.2 µg/m ³ (<50 - 192 µg/m ³)	<50

^{a.} Values in parentheses are results from DEQ's analyses.

^{b.} The scenario without engines was not analyzed because the scenario with engines already has a very small setback distance compared to other pollutant scenarios without engines.

Required Setback Distances for Specific Pollutants, Averaging Periods, and Meteorological Datasets		
Meteorological Data	Setback (m)	
PM₁₀ 24-hour Modeling Results	4,000 ton/day production, with engines^a	4,000 ton/day production, without engines^a
Boise	80	80
Bonniers Ferry	90	90
Burley	105	105
Coeur d'Alene	120	120
Challis	80	80
Grangeville	75	75
Idaho Falls	95	95
INL/Grid3 Mesowest site	65 (65)	65 (65)
Jerome	105	105
Lewiston	70	70
McCall	75	75
Moscow	115 (115)	115 (115)
Mountain Home	75 (75)	75 (75)
Pocatello (DEQ tower)	<50	<50
Pocatello Airport	80	80
Rexburg	110 (105)	105 (105)
Sandpoint	135 (125)	135 (125)
Soda Springs (P4 Rambol data)	115	115
Spokane	105	105
Twin Falls	80	75

PM_{2.5} 24-hour Modeling Results	4,000 ton/day production, with engines	4,000 ton/day production, with/out engines
Boise	100	90
Bonniers Ferry	55	55
Burley	105	95
Coeur d'Alene	115	110
Challis	65	65
Grangeville	54	65
Idaho Falls	95	90
INL/Grid3 Mesowest site	135 (140)	60 (120)
Jerome	100	95
Lewiston	65	60
McCall	65	65
Moscow	115 (115)	110
Mountain Home	135 (80)	75
Pocatello (DEQ tower)	60	<50
Pocatello Airport	80	75
Rexburg	100 (95)	95
Sandpoint	125 (110)	120
Soda Springs (P4 Rambol data)	105	100
Spokane	100	95
Twin Falls	75	75

^a Values in parentheses are results from DEQ's analyses.

Required Setback Distances for Specific Pollutants, Averaging Periods, and Meteorological Datasets		
Meteorological Data	Setback (m)	
PM_{2.5} Annual Modeling Results	325,000 ton/year production, with engines^a	325,000 ton/year production, without engines^a
Boise	<50 - max = 10.14 µg/m ³	<50
Burley	<50 - max = 9.89 µg/m ³	<50
Coeur d'Alene	<50 - max = 9.81 µg/m ³	<50
Challis	<50 - max = 9.13 µg/m ³	<50
Grangeville	<50 - max = 9.11 µg/m ³	<50
Idaho Falls	<50 - max = 10.04 µg/m ³	<50
INL/Grid3 Mesowest site	<50 - max = 9.29 µg/m ³	<50
Jerome	<50 - max = 9.61 µg/m ³	<50
Lewiston	<50 - max = 9.04 µg/m ³	<50
McCall	<50 - max = 8.89 µg/m ³	<50
Moscow	<50 - max = 9.77 µg/m ³	<50
Mountain Home	<50 - max = 9.57 µg/m ³	<50
Pocatello (DEQ tower)	<50 - max = 8.88 µg/m ³	<50
Pocatello Airport	<50 - max = .68 µg/m ³	<50
Rexburg	<50 - max = 9.99 µg/m ³ (<50 – 10.0 µg/m ³)	<50
Sandpoint	<50 - max = 10.07 µg/m ³	<50
Soda Springs (P4 Rambol data)	<50 - max = 9.88 µg/m ³	<50
Spokane	<50 - max = 9.81 µg/m ³	<50
Twin Falls	<50 - max = 9.92 µg/m ³	<50

NO₂ Annual Modeling Results	325,000 ton/year production, with engines	325,000 ton/year production, without engines
Boise	<50 (max = 19.2 µg/m ³)	<50
Burley	<50 (max = 19.5 µg/m ³)	<50
Coeur d'Alene	<50 (max = 18.7 µg/m ³)	<50
Challis	<50 (max = 18.1 µg/m ³)	<50
Grangeville	<50 (max = 18.7 µg/m ³)	<50
Idaho Falls	<50 (max = 19.5 µg/m ³)	<50
INL/Grid3 Mesowest site	<50 (max = 19.3 µg/m ³)	<50
Jerome	<50 (max = 19.1 µg/m ³)	<50
Lewiston	<50 (max = 18.3 µg/m ³)	<50
McCall	<50 (max = 18.3 µg/m ³)	<50
Moscow	<50 (max = 19.3 µg/m ³)	<50
Mountain Home	<50 (max = 19.5 µg/m ³)	<50
Pocatello (DEQ tower)	<50 (max = 19.2 µg/m ³)	<50
Pocatello Airport	<50 (max = 19.1 µg/m ³)	<50
Rexburg	<50 (max = 19.5 µg/m ³)	<50
Sandpoint	<50 (max = 19.0 µg/m ³)	<50
Soda Springs (P4 Rambol data)	<50 (max = 18.5 µg/m ³)	<50
Spokane	<50 (max = 18.8 µg/m ³)	<50
Twin Falls	<50 (max = 18.8 µg/m ³)	<50

^b Values in parentheses are results from DEQ's analyses.

Setback Distances for Specific Pollutants, Averaging Periods, and Meteorological Datasets	
TAPs Modeled and Meteorological Dataset Used	Setback (meters) With or Without Generators, for 325,000 ton/year Production^a
Acetaldehyde^b AACC = 4.5 E-1 µg/m³	
Burley	(<50 (max = 1.0 E-2 µg/m ³))
INL/Grid3 Mesowest site	<50 - max = 1.39 E-2 µg/m ³
Arsenic^b AACC = 2.3 E-4 µg/m³	
INL/Grid3 Mesowest site	(<50 - max = 9.2 E-6 µg/m ³)
Burley	(<50 (max = 4.7 E-6 µg/m ³))
Benzene^b (AACC = 1.2 E-1 µg/m³)	
Burley	(<50 (max = 3.3 E-3 µg/m ³))
INL/Grid3 Mesowest site	(<50 (max = 6.6 E-3 µg/m ³))
Cadmium^b AACC = 5.6 E-4 µg/m³	
INL/Grid3 Mesowest site	(<50 (max = 9.0 E-6 µg/m ³))
Burley	(<50 (max = 8.7 E-6 µg/m ³))
Chromium 6+^b AACC = 8.3 E-4 µg/m³	
INL/Grid3 Mesowest site	(<50 (max = 7.2 E-6 µg/m ³))
Burley	(<50 (max = 3.6 E-6 µg/m ³))
Formaldehyde^b AACC = 7.7 E-2 µg/m³	
Burley	(<50 (max = 2.6 E-2 µg/m ³))
INL/Grid3 Mesowest site	(<50 (max = 5.2 E-2 µg/m ³))
Mountain Home	(<50 (max = 4.7 E-2 µg/m ³))
Moscow	(<50 (max = 2.4 E-2 µg/m ³))
Nickle^b AACC = 4.2 E-3 µg/m³	
Burley	(<50 (max = 5.1 E-4 µg/m ³))
INL/Grid3 Mesowest site	(<50 (max = 1.0 E-3 µg/m ³))
Mountain Home	(<50 (max = 9.2 E-4 µg/m ³))
Moscow	(<50 (max = 4.8 E-4 µg/m ³))
POM^b AACC = 3.0 E-4 µg/m³	
Burley	(70)
INL/Grid3 Mesowest site	(65)
Mountain Home	(70)
Moscow	(65)
Polyaromatic Hydrocarbon (PAH) Compounds	
2-Methylnaphthalene (PAH)^b AACC = 1.4 E-2 µg/m³	
Burley	(<50 - max = 7.5 E-3 µg/m ³)
INL/Grid3 Mesowest site	<50 - max = 1.82 E-3 µg/m ³
Acenaphthylene (PAH)^b AACC = 1.4 E-2 µg/m³	
INL/Grid3 Mesowest site	<50 - max = 2.35 E-4 µg/m ³
Anthracene (PAH)^b AACC = 1.4 E-2 µg/m³	
INL/Grid3 Mesowest site	<50 - max = 3.32 E-5 µg/m ³
Fluorene (PAH)^b AACC = 1.4 E-2 µg/m³	
INL/Grid3 Mesowest site	<50 - max = 1.18 E-4 µg/m ³
Naphthalene (PAH) AACC = 1.4 E-2 µg/m³	
Boise	<50 - max = 3.94 E-3 µg/m ³
Burley	<50 - max = 3.84 E-3 µg/m ³ (<50 (max = 5.6 E-3 µg/m ³))
Coeur d'Alene	<50 - max = 1.78 E-3 µg/m ³
Challis	<50 - max = 1.81 E-3 µg/m ³
Grangeville	<50 - max = 2.07 E-3 µg/m ³
Idaho Falls	<50 - max = 6.37 E-3 µg/m ³
INL/Grid3 Mesowest site	<50 - max = 6.96 E-3 µg/m ³ (<50 (max = 1.1 E-2 µg/m ³))
Jerome	<50 - max = 4.10 E-3 µg/m ³
Lewiston	<50 - max = 1.88 E-3 µg/m ³
McCall	<50 - max = 2.36 E-3 µg/m ³
Moscow	<50 - max = 3.27 E-3 µg/m ³ (<50 (max = 5.3 E-3 µg/m ³))
Mountain Home	<50 - max = 6.31 E-3 µg/m ³ (<50 (max = 1.0 E-2 µg/m ³))
Pocatello (DEQ tower)	<50 - max = 6.70 E-3 µg/m ³

Setback Distances for Specific Pollutants, Averaging Periods, and Meteorological Datasets	
TAPs Modeled and Meteorological Dataset Used	Setback (meters) With or Without Generators, for 325,000 ton/year Production^a
Pocatello Airport	<50 - max = 5.17 E-3 $\mu\text{g}/\text{m}^3$
Rexburg	<50 - max = 4.34 E-3 $\mu\text{g}/\text{m}^3$
Sandpoint	<50 - max = 2.34 E-3 $\mu\text{g}/\text{m}^3$
Soda Springs (P4 Rambol data)	<50 - max = 3.71 E-3 $\mu\text{g}/\text{m}^3$
Spokane	<50 - max = 2.83 E-3 $\mu\text{g}/\text{m}^3$
Twin Falls	<50 - max = 4.94 E-3 $\mu\text{g}/\text{m}^3$
Phenanthrene (PAH)^b AACC = 1.4 E-2 $\mu\text{g}/\text{m}^3$	
INL/Grid3 Mesowest site	<50 - max = 2.46 E-4 $\mu\text{g}/\text{m}^3$

- ^{a.} Values in parentheses are results from DEQ's analyses. Values are higher from DEQ's analyses for some TAPs because emissions from the drum dryer had emissions from silo loading added to them (since those emissions are routed back to the dryer). Submitted analyses assumed these emissions will be eliminated by combustion within the dryer.
- ^{b.} Additional meteorological datasets were not used in the analyses because impacts were so far below applicable standards that DEQ concluded that analysis of other datasets could not result in a modeled violation.

APPENDIX C – FACILITY DRAFT COMMENTS

The following comments were received from the facility on July 10, 2020:

Facility Comment: The RFO sulfur content for the Tier 4 engines should be 0.5% instead of 15 ppm.

DEQ Response: The FRO sulfur content listed in the SOB and PTC will be changed to 0.5%.

Facility Comment: The date of manufacture for the Tier 4 engines is 2020, not 2015.

DEQ Response: Since the application originally specified the date of manufacture as 2015, DEQ requested a revised HMAP form with the correct date. The date of manufacture for the Tier 4 engines will be changed in the SOB and PTC to 2020.

APPENDIX D – PROCESSING FEE

PTC Processing Fee Calculation Worksheet

Instructions:

Fill in the following information and answer the following questions with a Y or N. Enter the emissions increases and decreases for each pollutant in the table.

Company: Knife River Corporation - Mountain
Address: 5450 W. Gowen Rd.
City: Boise
State: Idaho
Zip Code: 83709
Facility Contact: Josh Smith
Title: Asphalt Operations Manager
AIRS No.: 324121

N Does this facility qualify for a general permit (i.e. concrete batch plant, hot-mix asphalt plant)? Y/N

Y Did this permit require engineering analysis? Y/N

N Is this a PSD permit Y/N (IDAPA 58.01.01.205.04)

Emissions Inventory			
Pollutant	Annual Emissions Increase (T/yr)	Annual Emissions Reduction (T/yr)	Annual Emissions Change (T/yr)
NO _x	0.0	0	0.0
SO ₂	0.0	0	0.0
CO	0.0	0	0.0
PM10	0.0	0	0.0
VOC	0.0	0	0.0
Total:	0.0	0	0.0
Fee Due	\$ 1,000.00		

Comments: