Statement of Basis
Hot Mix Asphalt Plant General Permit

Permit to Construct No. P-2020.0008
Project ID 62446

Knife River Corporation - Mountain West - 00614
Boise, Idaho

Facility ID 777-00614

Final

July 30, 2020
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Permit Writer

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
acfm	actual cubic feet per minute
ASTM	American Society for Testing and Materials
BACT	Best Available Control Technology
BMP	best management practices
Btu	British thermal units
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CAS No.	Chemical Abstracts Service registry number
CBP	concrete batch plant
CEMS	continuous emission monitoring systems
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CI	compression ignition
CMS	continuous monitoring systems
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent emissions
COMS	continuous opacity monitoring systems
DEQ	Department of Environmental Quality
dscf	dry standard cubic feet
EL	screening emission levels
EPA	U.S. Environmental Protection Agency
FEC	Facility Emissions Cap
GHG	greenhouse gases
gph	gallons per hour
gpm	gallons per minute
gr	grains (1 lb = 7,000 grains)
HAP	hazardous air pollutants
HHV	higher heating value
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
iwg	inches of water gauge
km	kilometers
lb/hr	pounds per hour
lb/qtr	pound per quarter
LPG	Liquid Petroleum Gas
m	meters
MACT	Maximum Achievable Control Technology
mg/dscm	milligrams per dry standard cubic meter
MMBtu	million British thermal units
MMscf	million standard cubic feet
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_2	nitrogen dioxide

NO_X	nitrogen oxides
NSPS	New Source Performance Standards
O&M	operation and maintenance
O_2	oxygen
PAH	polyaromatic hydrocarbons
PC	permit condition
PCB	polychlorinated biphenyl
PERF	Portable Equipment Relocation Form
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
ppmw	parts per million by weight
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PTC	permit to construct
PTC/T2	permit to construct and Tier II operating permit
PTE	potential to emit
PW	process weight rate
RAP	recycled asphalt pavement
RFO	reprocessed fuel oil
RICE	reciprocating internal combustion engines
Rules	*Rules for the Control of Air Pollution in Idaho*
scf	standard cubic feet
SCL	significant contribution limits
SIP	State Implementation Plan
SM	synthetic minor
SM80	synthetic minor facility with emissions greater than or equal to 80% of a major source threshold
SO_2	sulfur dioxide
SO_x	sulfur oxides
T/day	tons per calendar day
T/hr	tons per hour
T/yr	tons per consecutive 12 calendar month period
T2	Tier II operating permit
TAP	toxic air pollutants
TEQ	toxicity equivalent
T-RACT	Toxic Air Pollutant Reasonably Available Control Technology
ULSD	ultra-low sulfur diesel
U.S.C.	United States Code
VOC	volatile organic compounds
yd^3	cubic yards
$\mu g/m^3$	micrograms per cubic meter

FACILITY INFORMATION

Description

Knife River Corporation – Mountain West - 00614 has proposed a new portable drum-mix asphalt plant. The asphalt plant consists of a counter-flow asphalt drum mixer equipped 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 facility as follows. First, stockpiled aggregate is transferred to feed bins. The applicant has also requested that recycled asphalt pavement (RAP) is 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, liquid petroleum gas, (LPG)/propane, #2 diesel fuel, and used oil (RFO4). 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. As part of the operation, the applicant has proposed that a portable rock crusher be allowed to be collocated at the facility.

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.

There are two 670 bhp I.C. Engines. Both engines will be run in parallel during the day at ten hours each, with only one engine running 14 hours at night. The total annual hours for both I.C. engines is 4,500 hours per year.

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).

May 12, 2020	P-2020.0008 PROJ 62394, Initial Permit to Construct (PTC), Permit status (A, but will become S upon issuance of this permit)

Application Scope

This PTC is for a minor modification at an existing minor facility.

The applicant has proposed to:

- To allow operation at a site specific location in Cascade for a portable hot mix asphalt plant.

Application Chronology

May 12, 2020	DEQ received an application.
May 18, 2020	DEQ received an application fee.
May 18, 2020	DEQ received the permit processing fee.
May 19 – June 3, 2020	DEQ provided an opportunity to request a public comment period on the application and proposed permitting action.
June 15, 2020	DEQ determined that the application was complete.
June 16, 2020	DEQ made available the draft permit and statement of basis for peer and regional office review.
July 24, 2020	DEQ made available the draft permit and statement of basis for applicant review.

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 PM_{10} emissions from aggregate handling.

Emissions Units and Control Equipment

Table 1 EMISSIONS UNIT AND CONTROL EQUIPMENT INFORMATION

Source ID No.	Sources	Control Equipment	Emission Point ID No.
Materials Handling	Material Transfer Points: 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	N/A
Hot Mix Asphalt Drum Mixer	Asphalt Drum Mixer: Manufacturer: AESCO/MADSEN Model: CFM 2540 Type: Counter-flow Manufacture Date: January 2020 Max. production: 250 T/hr, 3,000 T/hr, and 300,000 T/yr Fuel(s): Natural gas, LPG/propane, #2 fuel oil, and used oil (RFO4) Sulfur content: 0.0015% by weight	Asphalt Drum Mixer Baghouse: Manufacturer: AESCO/MADSEN Model: HRB-680 Flow rate: 50,000 dscfm PM_{10} control efficiency: 99.9%	Exit height: 23 ft 7 inches (7.2 m) Exit diameter: 4.5 ft (1.4 m) Exit flow rate: 50,000 acfm Exit temperature: 230 °F (110 ºC)
Asphaltic Oil Tank Heater	Asphaltic Oil Tank Heater: Heat input rating: 0.273 MMBtu/hr Fuel(s): None, Line Power Only	N/A	N/A
Primary IC Engine	Primary IC Engine (Tier 4): Manufacturer: CAT Model: C18 or equivalent Manufacture Date: 2020 Max. power rating: 670 bhp Fuel: #2 Fuel Oil ULSD diesel Sulfur content: 0.0015% by weight Daily operational limit: 10 hrs/day Annual operational limit: 1,000 hrs/yr	N/A	Exit height: 7 ft (2.1 m) Exit diameter: .5 ft (0.2 m) Exit flow rate: 2465.3 acfm Exit temperature: 836.8 °F (447.1ºC)
Secondary IC Engine	Secondary IC Engine (Tier 4): Manufacturer: CAT Model: C18 or equivalent Manufacture Date: 2020 Max. power rating: 670 bhp Fuel: #2 Fuel Oil ULSD diesel Sulfur content: 0.0015% by weight Daily operational limit: 24 hrs/day Annual use limit: 3500 hrs/yr	N/A	Exit height: 7 ft (2.1 m) Exit diameter: .5 ft (0.2 m) Exit flow rate: 2465.3 acfm Exit temperature: 836.8 °F (447.1ºC)

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 250 ton HMA/hour, 3,000 ton HMA/day, and 300,000 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 primary IC engine powering a generator has a maximum brake-horsepower rating of less than less than or equal to 670 bhp, and proposed operation of up to 10 hour/day and 1,000 hour/year (per the applicant).
- The secondary IC engine powering a generator has a maximum brake-horsepower rating of less than less than or equal to 670 bhp and proposed operation of up to 24 hour/day and 3,500 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 x 300,000 T/yr = 1,200,000 T/yr).
- For the asphaltic oil tank heater uncontrolled emissions were scaled up from 2,000 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 the primary IC engine uncontrolled emissions were scaled up from 1,000 hours per year of permitted operation (as proposed by the applicant) to 8,760 hours per year for full-time operation.
- For the secondary IC engine controlled emissions were scaled up from 3,500 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	CO_2e
	T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
Point Sources						
Asphalt drum mixer	13.38	10.68	33.00	78.00	19.20	21,122.23
Asphaltic oil tank heater[(a)]	-	-	-	-	-	
Primary IC engine and Secondary IC engine[(b)]	0.59	0.02	4.96	8.67	0.48	
Load-out and silo filling	0.67	-	-	1.52	2.42	
Materials handling	0.57	0.00	0.00	0.00	0.00	
Total, Point Sources	**15.21**	**10.70**	**37.96**	**88.19**	**22.10**	**21,122.2**

a) The Asphaltic Oil Tank Heater is electric – no emissions
b) The I.C. engines will not be used at the site specific location of 11148 Highway 55, Cascade, Idaho 83611. The uncontrolled emissions can be reduced by backing out the I.C. engines emissions listed in the table above.

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[(a)]**

IDAPA Listing	Hazardous Air Pollutants	Uncontrolled PTE (T/yr)
585	Dioxins	1.16-10
	Furans	2.91E-10
	Acrolein	3.56E-03
	Antimony	2.47E-05
	Barium	7.94E-04
	Chromium	7.53E-04
	Cobalt	3.56E-06
	Copper	4.25E-04
	Ethyl benzene	3.51E-02
	Hexane	1.29E-01
	Manganese	1.05E-03
	Methyl chloroform	6.57E-03
	Methyl ethyl ketone (MEK)	3.67E-03
	Naphthalene	9.03E-02
	Phosphorus	3.83E-03
	Propionaldehyde	1.78E-02
	Quinone	2.19E-02
	Selenium	4.79E-05
	Silver	6.57E-05
	Thallium	5.62E-07
	Toluene	3.99E-01
	Xylene	3.86E-02
	Zinc	8.35E-03
586	Acetaldehyde	1.78E-01
	Arsenic	7.67E-05

IDAPA Listing	Hazardous Air Pollutants	Uncontrolled PTE (T/yr)
586	Benzene	5.43E-02
	Benzo(a)anthracene	5.71E-05
	Benzo(a)pyrene	2.42E-06
	Benzo(b)fluoranthene	1.72E-05
	Benzo(k)fluoranthene	6.64E-06
	Cadmium	5.62E-05
	Chrysene	1.46E-04
	Dibenzo(a,h)anthracene	1.73E-07
	Formaldehyde	4.37E-01
	Hexavalent Chromium	6.16E-05
	Indeno(1,2,3-cd)pyrene	1.18E-06
	Nickel	8.63E-03
Not listed	Acenaphthene	4.77E-04
	Acenaphthylene	3.03E-03
	Anthracene	5.03E-04
	Benzo(e)pyrene	2.20E-05
	Benzo(g,h,l)perylene	6.37E-06
	Fluoranthene	1.59E-04
	Fluorene	2.22E-03
	Isooctane	5.49E-03
	Mercury	3.56E-04
	2-Methylnaphthalene	2.62E-02
	Perylene	2.19E-05
	Phenanthrene	4.16E-03
	Pyrene	6.34E-04
	Total	**1.48E+00**

a) The emissions listed in this table include the I.C. engine HAP emissions.

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.

This is an existing facility; there are no changes to the throughput or emission units. This is a modified permit to allow for site specific operations. Therefore there is no change from pre to post project potential to emit.

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

Emissions Unit	$PM_{10}/PM_{2.5}$		SO_2		NO_X		CO		VOC		CO_2e
	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)]	T/yr[(b)]
Asphalt drum mixer	5.58	3.35	4.45	2.67	13.75	8.25	32.50	19.50	8.00	4.80	5,818.96
Asphaltic oil tank heater[(c)]	-	-	-	-	-	-	-	-	-	-	
Primary IC engine and Secondary IC engine[(d)(e)]	0.52	0.58	0.01	0.01	4.41	4.95	7.71	8.68	0.42	0.47	
Load-out and silo filling	0.27	0.17	-	-	-	-	0.63	0.38	1.01	0.61	
Pre-Project Totals	**6.37**	**4.10**	**4.46**	**2.68**	**18.16**	**13.20**	**40.84**	**28.56**	**9.43**	**5.88**	**5,818.96**

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.
c) The Asphaltic Oil Tank Heater is electric – no emissions
d) The primary and secondary IC engines are both 670 bhp and will be run in parallel, the emissions in table 4.2 are a sum of the primary and secondary IC engines.
e) The I.C. engines will not be used at the site specific location of 11148 Highway 55, Cascade, Idaho 83611. The uncontrolled emissions can be reduced by backing out the I.C. engines emissions listed in the table above.

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		CO_2e
	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]	T/yr[b]
Asphalt drum mixer	5.58	3.35	4.45	2.67	13.75	8.25	32.50	19.50	8.00	4.80	5,818.96
Asphaltic oil tank heater[c]	-	-	-	-	-	-	-	-	-	-	
Primary IC engine and Secondary IC engine[d][e]	0.52	0.58	0.01	0.01	4.41	4.95	7.71	8.68	0.42	0.47	
Load-out and silo filling	0.27	0.17	-	-	-	-	0.63	0.38	1.01	0.61	
Post Project Totals	**6.37**	**4.10**	**4.46**	**2.68**	**18.16**	**13.20**	**40.84**	**28.56**	**9.43**	**5.88**	**5,819.00**

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.
c) The Asphaltic Oil Tank Heater is electric – no emissions
d) The primary and secondary IC engines are both 670 bhp and will be run in parallel, the emissions in table 4.2 are a sum of the primary and secondary IC engines.
e) The I.C. engines will not be used at the site specific location of 11148 Highway 55, Cascade, Idaho 83611. The uncontrolled emissions can be reduced by backing out the I.C. engines emissions listed in the table above.

As demonstrated in Tables 2 and 4, this facility has uncontrolled potential to emit for PM_{10}, SO_2, NO_X, VOC, and CO_2e emissions less than the Major Source threshold of 100 T/yr and 100,000 T/yr respectively. Uncontrolled CO emissions are greater than the Major Source threshold of 100 T/yr. A controlled potential to emit for PM_{10}, SO_2, NO_X, CO, and VOC, and CO_2e emissions are less than the Major Source threshold of 100 T/yr and 100,000 T/yr respectively. 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 Synthetic 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 5 CHANGES IN POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Emissions	$PM_{10}/PM_{2.5}$		SO_2		NO_X		CO		VOC		CO_2e
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	T/yr
Pre-Project Potential to Emit	6.37	4.10	4.46	2.68	18.16	13.20	40.84	28.56	9.43	5.88	5,818.96
Post Project Potential to Emit	6.37	4.10	4.46	2.68	18.16	13.20	40.84	28.56	9.43	5.88	5,818.96
Changes in Potential to Emit	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

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 6 PRE- AND POST PROJECT POTENTIAL TO EMIT FOR NON-CARCINOGENIC TOXIC AIR POLLUTANTS[(a)]

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	1.05E-01	1.05E-01	0.00E+00	119	No
Acrolein	3.25E-03	3.25E-03	0.00E+00	0.017	No
Antimony	2.25E-05	2.25E-05	0.00E+00	0.033	No
Barium	7.25E-04	7.25E-04	0.00E+00	2	No
Carbon disulfide	3.11E-04	3.11E-04	0.00E+00	0.033	No
Chromium metal (II and III)	6.88E-04	6.88E-04	0.00E+00	0.033	No
Cobalt metal dust, and fume	3.25E-06	3.25E-06	0.00E+00	0.0033	No
Copper (fume)	3.88E-04	3.88E-04	0.00E+00	0.013	No
Crotonaldehyde	1.08E-02	1.08E-02	0.00E+00	0.38	No
Cumene	5.72E-04	5.72E-04	0.00E+00	16.3	No
Ethyl benzene	3.20E-02	3.20E-02	0.00E+00	29	No
Ethyl chloride (Chloroethane)	6.20E-05	6.20E-05	0.00E+00	176	No
Heptane	1.18E+00	1.18E+00	0.00E+00	109	No
Hexane	1.17E-01	1.17E-01	0.00E+00	12	No
Manganese as Mn (fume)	9.63E-04	9.63E-04	0.00E+00	0.067	No
Mercury (alkyl compounds as Hg)	3.25E-04	3.25E-04	0.00E+00	0.001	No
Methyl bromide	1.25E-04	1.25E-04	0.00E+00	1.27	No
Methyl chloride (Chloromethane)	4.28E-04	4.28E-04	0.00E+00	6.867	No
Methyl chloroform	6.00E-03	6.00E-03	0.00E+00	127	No
Methyl ethyl ketone (MEK)	3.35E-03	3.35E-03	0.00E+00	39.3	No
Phenol	5.03E-04	5.03E-04	0.00E+00	1.27	No
Phosphorous	3.50E-03	3.50E-03	0.00E+00	0.007	No
Propionaldehyde	1.63E-02	1.63E-02	0.00E+00	0.0287	No
Quinone	2.00E-02	2.00E-02	0.00E+00	0.027	No
Selenium	4.38E-05	4.38E-05	0.00E+00	0.013	No
Silver as Ag (soluble)	6.00E-05	6.00E-05	0.00E+00	0.001	No
Styrene monomer	1.20E-04	1.20E-04	0.00E+00	6.67	No
Thallium	5.13E-07	5.13E-07	0.00E+00	0.007	No
Toluene	3.65E-01	3.65E-01	0.00E+00	25	No
Xylene	3.52E-02	3.52E-02	0.00E+00	29	No
Zinc metal	7.63E-03	7.63E-03	0.00E+00	0.667	No

a) The emissions listed in the table above include the emissions from the I.C. engines.

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 7 PRE- AND POST PROJECT POTENTIAL TO EMIT FOR CARCINOGENIC TOXIC AIR POLLUTANTS[a]

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	4.45E-02	4.45E-02	**0.00E+00**	**3.0E-03**	**No**
Arsenic	1.92E-05	1.92E-05	**0.00E+00**	**1.5E-06**	**Yes**
Benzene	1.36E-02	1.36E-02	**0.00E+00**	**8.0E-04**	**Yes**
Cadmium and compounds	1.40E-05	1.40E-05	**0.00E+00**	**3.7E-06**	**Yes**
Chromium (VI)	6.88E-04	6.88E-04	**0.00E+00**	**5.6E-07**	**Yes**
Dichloromethane	4.11E-06	4.11E-06	**0.00E+00**	**1.6E-03**	**No**
Formaldehyde	1.09E-01	1.09E-01	**0.00E+00**	**5.1E-04**	**Yes**
Nickel	2.16E-03	2.16E-03	**0.00E+00**	**2.7E-05**	**Yes**
PAHs Total	3.20E-02	3.20E-02	**0.00E+00**	**9.1E-05**	**Yes**
POM Total[b]	5.76E-05	5.76E-05	**0.00E+00**	**2.0E-06**	**Yes**
Tetrachloroethylene	4.00E-05	4.00E-05	**0.00E+00**	**1.3E-02**	**No**

a) The emissions listed in the table above include the emissions from the I.C. engines.
b) 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.

Some of the PTEs for carcinogenic TAPs were exceeded as a result of this project. Therefore, modeling is required for Arsenic, Benzene, Cadmium and compounds, Chromium (VI), Formaldehyde , Nickel , PAHs Total , and POM Total 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 8 POTENTIAL TO EMIT FOR HAZARDOUS AIR POLLUTANTS EMISSIONS[(a)]

IDAPA Listing	Hazardous Air Pollutants	PTE (T/yr)
585	Dioxins	2.90E-11
	Furans	7.27E-11
	Acrolein	3.25E-03
	Antimony	2.25E-05
	Barium	7.25E-04
	Chromium	6.88E-04
	Cobalt	3.25E-06
	Copper	3.88E-04
	Ethyl benzene	3.20E-02
	Hexane	1.17E-01
	Manganese	9.63E-04
	Methyl chloroform	6.00E-03
	Methyl ethyl ketone (MEK)	3.35E-03
	Naphthalene	2.26E-02
	Phosphorus	3.50E-03
	Propionaldehyde	1.63E-02
	Quinone	2.00E-02
	Selenium	4.38E-05
	Silver	6.00E-05
	Thallium	5.13E-07
	Toluene	3.65E-01
	Xylene	3.52E-02
	Zinc	7.63E-03
586	Acetaldehyde	4.45E-02
	Arsenic	1.92E-05
	Benzene	1.36E-02
	Benzo(a)anthracene	1.43E-05
	Benzo(a)pyrene	6.04E-07
	Benzo(b)fluoranthene	4.31E-06
	Benzo(k)fluoranthene	1.66E-06
	Cadmium	1.40E-05
	Chrysene	3.64E-05
	Dibenzo(a,h)anthracene	4.32E-08
	Formaldehyde	1.09E-01
	Hexavalent Chromium	1.54E-05
	Indeno(1,2,3-cd)pyrene	2.95E-07
	Nickel	2.16E-03
Not listed	Acenaphthene	1.19E-04
	Acenaphthylene	7.58E-04
	Anthracene	1.26E-04
	Benzo(e)pyrene	5.50E-06
	Benzo(g,h,l)perylene	1.59E-06
	Fluoranthene	3.98E-05
	Fluorene	5.54E-04
	Isooctane	5.01E-03
	Mercury	3.25E-04
	2-Methylnaphthalene	6.56E-03
	Perylene	5.48E-06
	Phenanthrene	1.04E-03
	Pyrene	1.59E-04
	Total	**0.82**

a) The emissions listed in the table above include the emissions from the I.C. engines.

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 PM_{10}, $PM_{2.5}$, NO_X, CO, VOC, HAP, and TAP from this project were 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 Guideline[1]. 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 Asphalt Production Limits permit condition,
- The Reduced Asphalt Production Limits permit condition,
- The Allowable Raw Materials permit condition,
- The Asphalt Operation Setback Distance Requirements permit condition,
- The Seasonal Operation permit condition, and
- The Relocation Requirement 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 uncontrolled HAPs (Total HAPs) emissions are > 25 T/yr and permitted emissions fall below

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

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 9 Regulated Air Pollutant Facility Classification

Pollutant	Uncontrolled PTE (T/yr)	Permitted PTE (T/yr)	Major Source Thresholds (T/yr)	AIRS/AFS Classification
PM	15.21	4.10	**100**	B
PM_{10}	15.21	4.10	**100**	B
$PM_{2.5}$	15.21	4.10	**100**	B
SO_2	10.70	2.68	**100**	B
NO_X	37.96	13.20	**100**	B
CO	88.19	28.56	**100**	B
VOC	22.10	5.88	**100**	B
HAP (single)	0.43	0.37	**10**	B
Total HAPs	1.48	0.82	**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 proposed new 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 PM_{10} 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 and 4.4.

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 ≥ 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 ≥ 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 250 T/hr, E is calculated as follows:

- Proposed throughput = 250 T/hr x 2,000 lb/1 T = 500,000 lb/hr

Therefore, E is calculated as:

- $E = 1.12 \times PW^{0.27} = 1.10 \times (500{,}000)^{0.27} = 38.72$ lb-PM/hr

As presented previously in the Emissions Inventories Section of this evaluation the post project PTE for this emissions unit is 6.63 lb-$PM_{10}/PM_{2.5}$ per hour. Assuming PM is 50% $PM_{10}/PM_{2.5}$ means that PM emissions will be 13.26 lb-PM/hr (6.63 lb- $PM_{10}/PM_{2.5}$ per hour ÷ 0.5 lb-$PM_{10}/PM_{2.5}$ per lb-PM). This is less than the calculated Rule requirement PM emissions rate of 38.72 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 PM_{10} 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 PM_{10}, SO_2, NO_X, CO, VOC, and HAP 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.

Table 10 PTE FOR THE HAZARDOUS AIR POLLUTANTS COMPARED TO THE MAJOR SOURCE THRESHOLDS[(a)]

Hazardous Air Pollutants	PTE (T/yr)	Major Source Threshold (T/yr)	Exceeds the Major Source Threshold?
Dioxins	2.90E-11	10	No
Furans	7.27E-11	10	No
Acrolein	3.25E-03	10	No
Antimony	2.25E-05	10	No
Barium	7.25E-04	10	No
Chromium	6.88E-04	10	No
Cobalt	3.25E-06	10	No
Copper	3.88E-04	10	No
Ethyl benzene	3.20E-02	10	No
Hexane	1.17E-01	10	No
Manganese	9.63E-04	10	No

Hazardous Air Pollutants	PTE (T/yr)	Major Source Threshold (T/yr)	Exceeds the Major Source Threshold?
Methyl chloroform	6.00E-03	10	No
Methyl ethyl ketone (MEK)	3.35E-03	10	No
Molybdenum	0.00E+00	10	No
Naphthalene	2.26E-02	10	No
Pentane	0.00E+00	10	No
Phosphorus	3.50E-03	10	No
Propionaldehyde	1.63E-02	10	No
Quinone	2.00E-02	10	No
Selenium	4.38E-05	10	No
Silver	6.00E-05	10	No
Thallium	5.13E-07	10	No
Toluene	3.65E-01	10	No
Vanadium	0.00E+00	10	No
Xylene	3.52E-02	10	No
Zinc	7.63E-03	10	No
Acetaldehyde	4.45E-02	10	No
Arsenic	1.92E-05	10	No
Benzene	1.36E-02	10	No
Benzo(a)anthracene	1.43E-05	10	No
Benzo(a)pyrene	6.04E-07	10	No
Benzo(b)fluoranthene	4.31E-06	10	No
Benzo(k)fluoranthene	1.66E-06	10	No
Beryllium	0.00E+00	10	No
1,3-Butadiene	0.00E+00	10	No
Cadmium	1.40E-05	10	No
Chrysene	3.64E-05	10	No
Dibenzo(a,h)anthracene	4.32E-08	10	No
Formaldehyde	1.09E-01	10	No
Hexavalent Chromium	1.54E-05	10	No
Indeno(1,2,3-cd)pyrene	2.95E-07	10	No
3-Methylchloranthrene	0.00E+00	10	No
Nickel	2.16E-03	10	No
Acenaphthene	1.19E-04	10	No
Acenaphthylene	7.58E-04	10	No
Anthracene	1.26E-04	10	No
Benzo(e)pyrene	5.50E-06	10	No
Benzo(g,h,l)perylene	1.59E-06	10	No
Dichlorobenzene	0.00E+00	10	No
Fluoranthene	3.98E-05	10	No
Fluorene	5.54E-04	10	No

Hazardous Air Pollutants	PTE (T/yr)	Major Source Threshold (T/yr)	Exceeds the Major Source Threshold?
Isooctane	5.01E-03	10	No
Mercury	3.25E-04	10	No
2-Methylnaphthalene	6.56E-03	10	No
Perylene	5.48E-06	10	No
Phenanthrene	1.04E-03	10	No
Pyrene	1.59E-04	10	No
Total	**0.82**	**25**	**No**

a) The emissions listed in the table above include the emissions from the I.C. engines.

As presented in the preceding table the PTE for each HAP is less than 10 T/yr and the PTE for all HAP combined is less than 25 T/yr. Therefore, this facility is not a HAP Major Source subject to Tier I requirements.

Therefore, it needs to be determined if this facility is a criteria pollutant Major Source. As discussed previously the Knife River Corporation – Mountain West - 00614 facility is located in Ada County (AQCR 64), which is designated as unclassifiable/attainment for $PM_{2.5}$, PM_{10}, SO_2, NO_x, CO, and Ozone for federal and state criteria air pollutants. Therefore, the following table compares the post-project facility-wide annual PTE for all criteria pollutants emitted by the source to the applicable criteria pollutant Major Source thresholds in order to determine if the facility is a criteria pollutant Major Source.

Table 11 PTE FOR REGULATED AIR POLLUTANTS COMPARED TO THE MAJOR SOURCE THRESHOLDS

Regulated Air Pollutants	PTE (T/yr)	Major Source Threshold (T/yr)	Exceeds the Major Source Threshold?
$PM_{10}/PM_{2.5}$	4.10	100	No
SO_2	2.68	100	No
NO_X	13.20	100	No
CO	28.56	100	No
VOC	5.88	100	No
CO_2e	5,819.00	100,000	No

As presented in the preceding table the PTE for each criteria pollutant is less than 100 T/yr. Therefore, this facility is not a criteria pollutant Major Source subject to Tier I requirements.

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. 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 a compression ignition IC engine that meets the definition of a non-road engine.

Note: If the IC engine remains at a site for more than12 months, the facility shall submit an application for a PTC modification to permit the engine as stationary source IC engine.

This requirement is assured by Permit Condition 2.5.

NSPS Applicability (40 CFR 60)

Because the facility has two compression ignition IC engines the following NSPS Subpart may be applicable:

- 40 CFR 60, Subpart I - National Standards of Performance for Hot Mix Asphalt Plants
- 40 CFR 60, Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

Because the facility is a portable HMA plant and has two non-road I.C. engines 40 CFR 60 IIII is not applicable. 40 CFR 60 IIII is only applicable to stationary I.C. Engines. If the facility is located at a site for 12 consecutive months or longer, the I.C. engines shall become stationary and no longer non-road, this subpart shall apply.

DEQ has been delegated authority to this subpart.

NESHAP Applicability (40 CFR 61)

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

GACT Applicability (40 CFR 63)

Because the facility has 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 NSPS Applicability (40 CFR 60) section, because the I.C. engines are non-road, the requirements of NESHAP Subpart ZZZZ do not apply to the two IC engines proposed for this project.

DEQ has been delegated authority to this subpart.

Permit Conditions Review

This section describes the permit conditions for this modified permit or 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 1.2 explains how to identify the permit conditions that have been modified or revised through this permitting action.

Permit Condition 1.3 explains which PTC this permitting action is replacing.

Permit Condition 3.9 establishes that when located at 11148 Highway 55, Cascade Idaho 83611:

- IC engines shall not be operated at this location;
- No setback is required;
- Relocation of the equipment every 12 months is not required;
- The drum dryer stack will be at least 36 feet above ground level at the point of release to the atmosphere;
- May collocate with one concrete batch plant listed in PTC No. P-2018.0042 issued January 29, 2020.

The emission inventory and modeling was reviewed without emissions from I.C. Engines. Modeling determined that when located at 11148 Highway 55, Cascade Idaho 83611, a setback is not required. Also, as this location is site specific for this project, relocation every 12 months is excluded from this specific site. Modeling also took collocating with the concrete batch plant from PTC No. P-2018.0042 into consideration and determined that this hot mix asphalt plant can be collocated with the concrete batch plant listed in P-2018.0042 at this site only, with the exception that the drum dryer stack is a minimum of 36 feet above ground level at the point of release to the atmosphere.

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

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 distallate 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, natural gas and/or LPG

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 distallate 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 distallate 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 certfied 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 diference 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 "SiloFill Criteria&TAPs" Calculations
1. All PM10 is assumed to be PM2.5.
2. If emissions are routed to the drum dryer is it presumed that the particulate matter (all sizes) control efficiency of the drum dryer is 97% , and as with previous versions of this spreadsheet, it is presumed that the TAP, CO and VOC emissions changes at the drum dryer are negligible.

CURRENT PTC APPLICATION VALUES

DEQ Verification Worksheets: Hot Mix Asphalt (HMA) Drum Mix Facility Data

Facility ID/AIRS No.	777-00614	Spreadsheet Date	7/27/2020 18:52
Permit No.	P-2018.0042	DEQ Version Date	8/13/2019
Facility Owner/Company Name:	Knife River Corporation -Mountain West		
Address:	5450 West Gowen Road		
City, State, Zip:	Boise, ID 83709		
Facility Contact:	Josh Smith		
Contact Number/ e-mail:	208-407-8918/josh.smith@kniferiver.com		
		Include Silo Fill Emissions?[1]	N
		Include Loadout Emissions?[1]	Y
		1)In some cases emissions may be routed to drum dryer, if they are input "N".	

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	AESCO/Madsen	Distallate (#2) Fuel Oil	1
Rated heat input capacity, MMBtu/hr	75	Used Oil or RFO4 Oil	1
Drum Dryer Hourly HMA Production, Tons/hour	250	Natural Gas	1
Max Production Per day, Tons per day	3,000	LPG or Propane	1
Max Annual HMA Production, Tons/year	1,200,000	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)	8,760	#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		**Fuel Type(s)**	**Fuel Toggle**
Hours of operation per day		#2 Fuel Oil	0
Operation, days per year (DEQ Assumption)	#DIV/0!	Fuel oil sulfur content	0.0015%
Max Hours of operation per year from Form HMAP		Natural Gas	1
		LPG or Propane	1

Asphaltic Oil Tank Heater Fuel Consumption Calculations	**#2 Fuel Oil**	**Natural Gas**
Heat Input Rating, MMBtu/hr	0.000	0.000
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]	0.00	0
Max Operational Hours per Year	0	0
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)			
IC Engine Make/Model		**Fuel Type(s)**	**IC Engine Toggle**
IC Engine Year Manufactured (yyyy)		#2 Fuel Oil (Diesel)	1
IC Engine Max Rated Power (bhp)		Max Sulfur weight percentage	0.0015%
IC Engine Max Rated Capacity (kW)	0	Max Operational Hours/Day	
		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 I, Tier 2, Tier 3, or Tier 4: Enter 1, 2, 3, or 4 Certified "BLUE SKY" engine: Enter 5			

ERROR - IC ENGINE 2 RATING IS LESS THAN 600 bhp

IC Engine 2 > 600 bhp (447 kW) AP-42 Section 3.4 (diesel fueled)			
IC Engine Make/Model		**Fuel Type(s)**	**IC Engine Toggle**
IC Engine Year Manufactured (yyyy)		#2 Fuel Oil (Diesel)	1
IC Engine Rated Capacity (bhp)		Max Sulfur weight percentage	0.0015%
IC Engine Max Rated Capacity (kW)	0	Max Operational Hours per Day	
		Max Operational Hours per Year	
IC Engine 2 EPA Certification:		Calculated Max Fuel Use Rate, gal/hr	0.00
Not EPA-certified: Enter "0" (zero)		Calculated MMBtu/hr	0.00
Certified Tier I, 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 conveyor t
M = moisture content (%)	3	Bulk aggregate for HMAstypically 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% contr
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

Facility:	**Knife River Corporation -Mountain**	**Facility ID:**	**777-00614**
7/27/2020 18:52	**Permit P-2018.0042**	**ERROR - GENERATOR RATING IS LESS THAN 447 kW**	

G2 Electrical Generator > 600 hp (447 kW)

Fuel Type Toggle =	1	
Fuel Consumption Rate	0.00	gal/hr
Calculated MMBtu/hr	0.00	MMBtu/hr
Max Daily Operation	0	hr/day
Max Annual Operation	0	hrs/yr

Rated Power (kW):	**0**
Not EPA Certified:	Yes
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

g/kW-hr x (lb/453g) x (hp-hr/7000 Btu) x (0.746 kW/hp) x 10^6 Btu/MMBtu = lb/MMBtu

g/kW-hr x 0.23486 = lb/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's*

Pollutant:	**NOx**	**VOC (total TOC--> VOCs)**		**CO**	**PM=PM10**
EMISSION FACTORS USED FOR G2 (lb/MMBtu):	**3.20**	**0.09**		**0.85**	**0.130**

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 engine out put converted to lb/MMBtu fuel input)

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	0	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 G1 (lb/MMBtu fuel input)

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	0	2014	0.00	0.00	0.00	0.00	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):				**0.00**	**0.00**	**0.00**	**0.00**	**0.000**

Facility: **Knife River Corporation -Mountain West**
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Max Hourly Production	250	T/hr	96%	T/hr is Aggregate & RAP =	**240 T/hr**
Max Daily Production	3,000	Tons/day	96%	T/day is Aggregate & RAP =	**2,880 T/day**
Max Annual Production	1,200,000	Tons/yr	96%	T/yr is Aggregate & RAP =	**1,152,000 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 stabiliizes between 3 and 5% by weight.

Windspeed Variation Factors for AERMOD modeling:				PM10		PM2.5	
Wind Category	Upper windspeed (m/sec)	Avg windspeed (m/sec)	Avg windspeed (mph)	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: **240 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	0.79	0.40	1.90	0.43	1.59	0.79	3.81	0.87
PM-10 (total)	1.56E-03	0.38	0.19	0.90	0.21	0.75	0.38	1.80	0.41
PM-2.5	2.37E-04	0.06	0.03	0.14	0.03	0.11	0.06	0.27	0.06

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: **240 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	7.93E-02	3.97E-02	1.90E-01	4.35E-02	1.59E-01	7.93E-02	3.81E-01	8.69E-02
PM-10 (total)	1.56E-03	3.75E-02	1.88E-02	9.00E-02	2.06E-02	7.50E-02	3.75E-02	1.80E-01	4.11E-02
PM-2.5	2.37E-04	5.68E-03	2.84E-03	1.36E-02	3.11E-03	1.14E-02	5.68E-03	2.73E-02	6.23E-03

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

Aggregate flow across scalping screen onto conveyor: **240 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	0.600	3.00E-01	1.44E+00	3.29E-01
PM-10 (total)	0.0087	0.209	1.04E-01	5.01E-01	1.14E-01
PM-2.5	1.30E-04	0.003	1.56E-03	7.49E-03	1.71E-03

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

Aggregate transfer from conveyor to drum dryer (1 transfer point): **240 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	7.93E-02	3.97E-02	1.90E-01	4.35E-02
PM-10 (total)	1.56E-03	3.75E-02	1.88E-02	9.00E-02	2.06E-02
PM-2.5	2.37E-04	5.68E-03	2.84E-03	1.36E-02	3.11E-03

Facility: Knife River Corporation -Mountain West
7/27/2020 18:52 **Permit/Facility ID: P-2018.0042 777-00614**

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) =	1
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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	19,800.00	1.00	19,800.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	7.20	21.00	151.20
N_2O	0.26	$lb/10^3$ gal	AP-42 Table 1.3-8	0.623294	310.00	193.22

Tank Heater	Emission Factor (EF)	EF Units	EF Source	T/yr	Global Warming Potential	CO_2e T/yr
CO_2	Assumes all carbon is converted to CO_2			0.00	1	0.00
Methane	0.216	$lb/10^3$ gal	AP-42 Table 1.3-3	0.00E+00	21	0.00
N_2O	0.26	$lb/10^3$ gal	AP-42 Table 1.3-8	0.00E+00	310	0.00

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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	19,800.00	1.00	19,800.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	7.20	21.00	151.20
N_2O	0.53	$lb/10^3$ gal	AP-42 Table 1.3-8	1.270561	310.00	393.87

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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	19,800.00	1.00	19,800.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	7.20	21.00	151.20
N_2O	0.26	$lb/10^3$ gal	AP-42 Table 1.3-8	0.623294	310.00	193.22

Tank Heater	Emission Factor (EF)	EF Units	EF Source	T/yr	Global Warming Potential	CO_2e 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_2O	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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	19,800.00	1.00	19,800.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	7.20	21.00	151.20
N_2O	0.26	$lb/10^3$ gal	AP-42 Table 1.3-8	0.623294	310.00	193.22

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_2e (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_2e (T/yr)
CO_2	1.16	lb/bhp-hr	AP-42 Table 3.4-1	0.00	1.00	0.00

Total Green House Gas Emissions

Total Emissions	CO_2e (T/yr)
CO_2	19,800.00
Methane	151.20
N_2O	393.87
Grand Total	**20,345.07**

Facility: Knife River Corporation -Mountain West

7/27/2020 18:52 **Permit/Facility ID:** **P-2018.0042** **777-00614**

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

A. Drum Mix Plant: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year **3,000** Tons/day

Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane

B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** 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: **0.00** gal/hour **0** Hours/year IC Engine > 600hp #2 Fuel Oil **0** 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)
PM (total)	8.25	0.00E+00	0.00E+00	1.30E-01	8.38
PM-10 (total)	5.75	0.00E+00	0.00E+00	1.30E-01	5.88
PM-2.5	5.58	0.00E+00	0.00E+00	1.30E-01	5.71
CO	32.50	0.00E+00	0.00E+00	3.37E-01	32.84
NOx	13.75	0.00E+00	0.00E+00		13.75
SO_2	4.45	0.00E+00	0.00E+00		4.45
VOC	8.00	0.00E+00	0.00E+00	9.77E-01	8.98
Lead	3.75E-03	0.00E+00	0.00E+00		3.75E-03
HCl [e]	5.25E-02	0.00E+00	0.00E+00		5.25E-02
Dioxins[e]					
2,3,7,8-TCDD	2.88E-11				**2.88E-11**
Total TCDD	1.27E-10				**1.27E-10**
1,2,3,7,8-PeCDD	4.25E-11				**4.25E-11**
Total PeCDD	3.01E-09				**3.01E-09**
1,2,3,4,7,8-HxCDD	5.75E-11	0.00E+00			**5.75E-11**
1,2,3,6,7,8-HxCDD	1.78E-10				**1.78E-10**
1,2,3,7,8,9-HxCDD	1.34E-10	0.00E+00			**1.34E-10**
Total HxCDD	1.64E-09				**1.64E-09**
1,2,3,4,6,7,8-Hp-CDD	6.58E-10	0.00E+00			**6.58E-10**
Total HpCDD	2.60E-09	0.00E+00			**2.60E-09**
Octa CDD	3.42E-09	0.00E+00			**3.42E-09**
Total PCDD[h]	1.08E-08	0.00E+00			**1.08E-08**
Furans[e]					
2,3,7,8-TCDF	1.33E-10				**1.33E-10**
Total TCDF	5.07E-10	0.00E+00			**5.07E-10**
1,2,3,7,8-PeCDF	5.89E-10				**5.89E-10**
2,3,4,7,8-PeCDF	1.15E-10				**1.15E-10**
Total PeCDF	1.15E-08	0.00E+00			**1.15E-08**
1,2,3,4,7,8-HxCDF	5.48E-10				**5.48E-10**
1,2,3,6,7,8-HxCDF	1.64E-10				**1.64E-10**
2,3,4,6,7,8-HxCDF	2.60E-10				**2.60E-10**
1,2,3,7,8,9-HxCDF	1.15E-09				**1.15E-09**
Total HxCDF	1.78E-09	0.00E+00			**1.78E-09**
1,2,3,4,6,7,8-HpCDF	8.90E-10				**8.90E-10**
1,2,3,4,7,8,9-HpCDF	3.70E-10				**3.70E-10**
Total HpCDF	1.37E-09	0.00E+00			**1.37E-09**
Octa CDF	6.58E-10	0.00E+00			**6.58E-10**
Total PCDF[h]	5.48E-09	0.00E+00			**5.48E-09**
Total PCDD/PCDF[h]	1.64E-08	0.00E+00	0.00E+00		**1.64E-08**
Non-PAH HAPs					
Acetaldehyde[e]	1.78E-01		0.00E+00		**1.78E-01**
Acrolein[e]	3.25E-03		0.00E+00		3.25E-03
Benzene[e]	5.34E-02	0.00E+00	0.00E+00	2.96E-04	**5.37E-02**
1,3-Butadiene[e]			0.00E+00		**0.00E+00**
Ethylbenzene[e]	3.00E-02			1.46E-03	3.15E-02
Formaldehyde[e]	4.25E-01	0.00E+00	0.00E+00	5.01E-04	**4.25E-01**
Hexane[e]	1.15E-01	0.00E+00		7.80E-04	1.16E-01
Isooctane	5.00E-03			9.36E-06	5.01E-03
Methyl Ethyl Ketone[e]	2.50E-03			2.55E-04	2.75E-03
Pentane[e]		0.00E+00			0.00E+00
Propionaldehyde[e]	1.63E-02				1.63E-02
Quinone[e]	2.00E-02				2.00E-02
Methyl chloroform[e]	6.00E-03				6.00E-03
Toluene[e]	3.63E-01	0.00E+00	0.00E+00	1.09E-03	3.64E-01
Xylene[e]	2.50E-02		0.00E+00	6.29E-03	3.13E-02
POM (7-PAH Group)[e]	7.50E-05	0.00E+00	0.00E+00	6.30E-05	**1.38E-04**
TOTAL PAH HAPs	1.21E-01	0.00E+00	0.00E+00	2.77E-03	**1.24E-01**

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 IC1 + IC2** 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)
PAH HAPs					
2-Methylnaphthalene	2.33E-02	0.00E+00		1.11E-03	**2.44E-02**
3-Methylchloranthrene[e]	0.00E+00	0.00E+00			**0.00E+00**
Acenaphthene	1.92E-04	0.00E+00	0.00E+00	1.21E-04	**3.13E-04**
Acenaphthylene	3.01E-03	0.00E+00	0.00E+00	1.31E-05	**3.03E-03**
Anthracene	4.25E-04	0.00E+00	0.00E+00	3.27E-05	**4.57E-04**
Benzo(a)anthracene[e]	2.88E-05	0.00E+00	0.00E+00	8.87E-06	**3.76E-05**
Benzo(a)pyrene[e]	1.34E-06	0.00E+00	0.00E+00	1.07E-06	**2.42E-06**
Benzo(b)fluoranthene[e]	1.37E-05	0.00E+00	0.00E+00	3.55E-06	**1.72E-05**
Benzo(e)pyrene	1.51E-05	0.00E+00		3.64E-06	**1.87E-05**
Benzo(g,h,i)perylene	5.48E-06	0.00E+00	0.00E+00	8.87E-07	**6.37E-06**
Benzo(k)fluoranthene[e]	5.62E-06	0.00E+00	0.00E+00	1.03E-06	**6.64E-06**
Chrysene[e]	2.47E-05	0.00E+00	0.00E+00	4.81E-05	**7.28E-05**
Dibenzo(a,h)anthracene[e]	0.00E+00	0.00E+00	0.00E+00	1.73E-07	**1.73E-07**
Dichlorobenzene	0.00E+00	0.00E+00			**0.00E+00**
Fluoranthene	8.36E-05	0.00E+00	0.00E+00	2.34E-05	**1.07E-04**
Fluorene	1.51E-03	0.00E+00	0.00E+00	3.60E-04	**1.87E-03**
Indeno(1,2,3-cd)pyrene[e]	9.59E-07	0.00E+00	0.00E+00	2.20E-07	**1.18E-06**
Naphthalene[e]	8.90E-02	0.00E+00	0.00E+00	5.84E-04	**8.96E-02**
Perylene	1.21E-06	0.00E+00		1.03E-05	**1.15E-05**
Phenanthrene	3.15E-03	0.00E+00	0.00E+00	3.78E-04	**3.53E-03**
Pyrene	4.11E-04	0.00E+00	0.00E+00	7.01E-05	**4.81E-04**
Non-HAP Organic Compounds					
Acetone[e]	1.04E-01	0.00E+00		1.08E-03	1.05E-01
Benzaldehyde	1.38E-02	0.00E+00			1.38E-02
Butane	8.38E-02	0.00E+00			8.38E-02
Butyraldehyde	2.00E-02	0.00E+00			2.00E-02
Crotonaldehyde[e]	1.08E-02	0.00E+00			1.08E-02
Ethylene	8.75E-01	0.00E+00		2.04E-02	8.95E-01
Heptane	1.18E+00	0.00E+00			1.18E+00
Hexanal	1.38E-02	0.00E+00			1.38E-02
Isovaleraldehyde	4.00E-03	0.00E+00			4.00E-03
2-Methyl-1-pentene	5.00E-01	0.00E+00			5.00E-01
2-Methyl-2-butene	7.25E-02	0.00E+00			7.25E-02
3-Methylpentane	2.38E-02	0.00E+00			2.38E-02
1-Pentene	2.75E-01	0.00E+00			2.75E-01
n-Pentane	2.63E-02	0.00E+00			2.63E-02
Valeraldehyde[e]	8.38E-03	0.00E+00			8.38E-03
Metals					
Antimony[e]	2.25E-05	0.00E+00			2.25E-05
Arsenic[e]	7.67E-05	0.00E+00			**7.67E-05**
Barium[e]	7.25E-04	0.00E+00			7.25E-04
Beryllium[e]	0.00E+00	0.00E+00			**0.00E+00**
Cadmium[e]	5.62E-05	0.00E+00			**5.62E-05**
Chromium[e]	6.88E-04	0.00E+00			6.88E-04
Cobalt[e]	3.25E-06	0.00E+00			3.25E-06
Copper[e]	3.88E-04	0.00E+00			3.88E-04
Hexavalent Chromium[e]	6.16E-05	0.00E+00			**6.16E-05**
Manganese[e]	9.63E-04	0.00E+00			9.63E-04
Mercury[e]	3.25E-04	0.00E+00			3.25E-04
Molybdenum[e]	0.00E+00	0.00E+00			0.00E+00
Nickel[e]	8.63E-03	0.00E+00			**8.63E-03**
Phosphorus[e]	3.50E-03	0.00E+00			3.50E-03
Silver[e]	6.00E-05	0.00E+00			6.00E-05
Selenium[e]	4.38E-05	0.00E+00			4.38E-05
Thallium[e]	5.13E-07	0.00E+00			5.13E-07
Vanadium[e]	0.00E+00	0.00E+00			0.00E+00
Zinc[e]	7.63E-03	0.00E+00			7.63E-03

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

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

A. Drum Mix Plant: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year HMA throughput **3,000** hrs/day
Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane
B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** 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: **0.00** gal/hour **0** Hours/year #2 Fuel Oil Generator > 600hp **0** 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[g]					
Bromomethane[e]				4.99E-05	4.99E-05
2-Butanone (see Methyl Ethyl Ketone)					
Carbon disulfide[e]				6.76E-05	6.76E-05
Chloroethane (Ethyl chloride[e])				1.09E-06	1.09E-06
Chloromethane (Methyl chloride[e])				7.80E-05	7.80E-05
Cumene				5.72E-04	5.72E-04
n-Hexane					
Methylene chloride (Dichloromethane[e])				0.00E+00	0.00E+00
MTBE					
Styrene[e]				3.80E-05	3.80E-05
Tetrachloroethene (Tetrachloroethylene[e])				4.00E-05	4.00E-05
1,1,1-Trichloroethane (Methyl chloroform[e])					
Trichloroethene (Trichloroethylene[e])					
Trichlorofluoromethane				6.76E-06	6.76E-06
m-/p-Xylene[e]				2.13E-03	2.13E-03
o-Xylene[e]				4.16E-03	4.16E-03
Phenol[e,f]				5.03E-04	5.03E-04
Non-HAP Organic Compounds					
Methane				3.38E-02	3.38E-02

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**		**EMISSION INVENTORY**
7/27/2020 18:52	**Permit/Facility ID:** **P-2018.0042**	**777-00614**	**TONS PER YEAR** Page 1 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: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year HMA throughput **3,000** hrs/day

Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane

B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** 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: **0.00** gal/hour **0** Hours/year IC Engine > 600hp #2 Fuel Oil **0** 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)	19.81	0.00E+00	0.00E+00	3.13E-01	19.81
PM-10 (total)	13.81	0.00E+00	0.00E+00	3.13E-01	13.81
PM-2.5	13.39	0.00E+00	0.00E+00	3.13E-01	13.39
CO	78.00	0.00E+00	0.00E+00	8.10E-01	78.00
NOx	33.00	0.00E+00	0.00E+00		33.00
SO_2	10.68	0.00E+00	0.00E+00		10.68
VOC	19.20	0.00E+00	0.00E+00	2.35E+00	19.20
Lead	9.00E-03	0.00E+00	0.00E+00		9.00E-03
HCl[e]	1.26E-01	0.00E+00	0.00E+00		1.26E-01
Dioxins[e]					
2,3,7,8-TCDD	1.26E-10				1.26E-10
Total TCDD	5.58E-10				5.58E-10
1,2,3,7,8-PeCDD	1.86E-10				1.86E-10
Total PeCDD	1.32E-08				1.32E-08
1,2,3,4,7,8-HxCDD	2.52E-10	0.00E+00			2.52E-10
1,2,3,6,7,8-HxCDD	7.80E-10				7.80E-10
1,2,3,7,8,9-HxCDD	5.88E-10	0.00E+00			5.88E-10
Total HxCDD	7.20E-09				7.20E-09
1,2,3,4,6,7,8-Hp-CDD	2.88E-09	0.00E+00			2.88E-09
Total HpCDD	1.14E-08	0.00E+00			1.14E-08
Octa CDD	1.50E-08	0.00E+00			1.50E-08
Total PCDD[h]	4.74E-08	0.00E+00			4.74E-08
Furans[e]					
2,3,7,8-TCDF	5.82E-10				5.82E-10
Total TCDF	2.22E-09	0.00E+00			2.22E-09
1,2,3,7,8-PeCDF	2.58E-09				2.58E-09
2,3,4,7,8-PeCDF	5.04E-10				5.04E-10
Total PeCDF	5.04E-08	0.00E+00			5.04E-08
1,2,3,4,7,8-HxCDF	2.40E-09				2.40E-09
1,2,3,6,7,8-HxCDF	7.20E-10				7.20E-10
2,3,4,6,7,8-HxCDF	1.14E-09				1.14E-09
1,2,3,7,8,9-HxCDF	5.04E-09				5.04E-09
Total HxCDF	7.80E-09	0.00E+00			7.80E-09
1,2,3,4,6,7,8-HpCDF	3.90E-09				3.90E-09
1,2,3,4,7,8,9-HpCDF	1.62E-09				1.62E-09
Total HpCDF	6.00E-09	0.00E+00			6.00E-09
Octa CDF	2.88E-09	0.00E+00			2.88E-09
Total PCDF[h]	2.40E-08	0.00E+00			2.40E-08
Total PCDD/PCDF[h]	7.20E-08	0.00E+00			7.20E-08
Non-PAH HAPs					
Acetaldehyde[e]	7.80E-01		0.00E+00		7.80E-01
Acrolein[e]	1.56E-02		0.00E+00		1.56E-02
Benzene[e]	2.34E-01	0.00E+00	0.00E+00	1.30E-03	2.34E-01
1,3-Butadiene[e]	0.00E+00		0.00E+00		0.00E+00
Ethylbenzene[e]	1.44E-01			6.99E-03	1.44E-01
Formaldehyde[e]	1.86E+00	0.00E+00	0.00E+00	2.20E-03	1.86E+00
Hexane[e]	5.52E-01	0.00E+00		3.74E-03	5.52E-01
Isooctane	2.40E-02			4.49E-05	2.40E-02
Methyl Ethyl Ketone[e]	1.20E-02			1.22E-03	1.20E-02
Pentane[e]	0.00E+00	0.00E+00			0.00E+00
Propionaldehyde[e]	7.80E-02				7.80E-02
Quinone[e]	9.60E-02				9.60E-02
Methyl chloroform[e]	2.88E-02				2.88E-02
Toluene[e]	1.74E+00	0.00E+00	0.00E+00	5.24E-03	1.74E+00
Xylene[e]	1.20E-01	0.00E+00	0.00E+00	3.02E-02	1.20E-01
TOTAL Federal HAPs (T/yr)=					**6.45E+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	1.02E-01	0.00E+00		4.87E-03	1.02E-01
3-Methylchloranthrene[e]	0.00E+00	0.00E+00			0.00E+00
Acenaphthene	8.40E-04	0.00E+00	0.00E+00	5.32E-04	8.40E-04
Acenaphthylene	1.32E-02	0.00E+00	0.00E+00	5.73E-05	1.32E-02
Anthracene	1.86E-03	0.00E+00	0.00E+00	1.43E-04	1.86E-03
Benzo(a)anthracene[e]	1.26E-04	0.00E+00	0.00E+00	3.89E-05	1.26E-04
Benzo(a)pyrene[e]	5.88E-06	0.00E+00	0.00E+00	4.70E-06	5.88E-06
Benzo(b)fluoranthene[e]	6.00E-05	0.00E+00	0.00E+00	1.55E-05	6.00E-05
Benzo(e)pyrene	6.60E-05	0.00E+00		1.60E-05	6.60E-05
Benzo(g,h,I)perylene	2.40E-05	0.00E+00	0.00E+00	3.89E-06	2.40E-05
Benzo(k)fluoranthene[e]	2.46E-05	0.00E+00	0.00E+00	4.50E-06	2.46E-05
Chrysene[e]	1.08E-04	0.00E+00	0.00E+00	2.11E-04	1.08E-04
Dibenzo(a,h)anthracene[e]	0.00E+00	0.00E+00	0.00E+00	7.57E-07	0.00E+00
Dichlorobenzene	0.00E+00	0.00E+00			0.00E+00
Fluoranthene	3.66E-04	0.00E+00	0.00E+00	1.02E-04	3.66E-04
Fluorene	6.60E-03	0.00E+00	0.00E+00	1.58E-03	6.60E-03
Indeno(1,2,3-cd)pyrene[e]	4.20E-06	0.00E+00	0.00E+00	9.61E-07	4.20E-06
Naphthalene[e]	3.90E-01	0.00E+00	0.00E+00	2.56E-03	3.90E-01
Perylene	5.28E-06	0.00E+00		4.50E-05	5.28E-06
Phenanthrene	1.38E-02	0.00E+00	0.00E+00	1.66E-03	1.38E-02
Pyrene	1.80E-03	0.00E+00	0.00E+00	3.07E-04	1.80E-03
Non-HAP Organic Compounds					
Acetone[e]	4.98E-01	0.00E+00		1.17E-03	4.98E-01
Benzaldehyde	6.60E-02	0.00E+00			6.60E-02
Butane	4.02E-01	0.00E+00			4.02E-01
Butyraldehyde	9.60E-02	0.00E+00			9.60E-02
Crotonaldehyde[e]	5.16E-02	0.00E+00			5.16E-02
Ethylene	4.20E+00	0.00E+00		1.77E-02	4.20E+00
Heptane	5.64E+00	0.00E+00			5.64E+00
Hexanal	6.60E-02	0.00E+00			6.60E-02
Isovaleraldehyde	1.92E-02	0.00E+00			1.92E-02
2-Methyl-1-pentene	2.40E+00	0.00E+00			2.40E+00
2-Methyl-2-butene	3.48E-01	0.00E+00			3.48E-01
3-Methylpentane	1.14E-01	0.00E+00			1.14E-01
1-Pentene	1.32E+00	0.00E+00			1.32E+00
n-Pentane[e]	1.26E-01	0.00E+00			1.26E-01
Valeraldehyde[e]	4.02E-02	0.00E+00			4.02E-02
Metals					
Antimony[e]	1.08E-04	0.00E+00			1.08E-04
Arsenic[e]	3.36E-04	0.00E+00			3.36E-04
Barium[e]	3.48E-03	0.00E+00			3.48E-03
Beryllium[e]	0.00E+00	0.00E+00			0.00E+00
Cadmium[e]	2.46E-04	0.00E+00			2.46E-04
Chromium[e]	3.30E-03	0.00E+00			3.30E-03
Cobalt[e]	1.56E-05	0.00E+00			1.56E-05
Copper[e]	1.86E-03	0.00E+00			1.86E-03
Hexavalent Chromium[e]	2.70E-04	0.00E+00			2.70E-04
Manganese[e]	4.62E-03	0.00E+00			4.62E-03
Mercury[e]	1.56E-03	0.00E+00			1.56E-03
Molybdenum[e]	0.00E+00	0.00E+00			0.00E+00
Nickel[e]	3.78E-02	0.00E+00			3.78E-02
Phosphorus[e]	1.68E-02	0.00E+00			1.68E-02
Silver[e]	2.88E-04	0.00E+00			2.88E-04
Selenium[e]	2.10E-04	0.00E+00			2.10E-04
Thallium[e]	2.46E-06				2.46E-06
Vanadium[e]	0.00E+00	0.00E+00			0.00E+00
Zinc[e]	3.66E-02	0.00E+00			3.66E-02

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

A. Drum Mix Plant: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year **3,000** Tons/day
Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane
B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** hrs/day
Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = Natural Gas
C1. Generator G1: **0.00** gal/hour **0** Hours/year #2 Fuel Oil IC Engine <600hp **0** hrs/day
C2. Generator G2: **0.00** gal/hour **0** Hours/year #2 Fuel Oil IC Engine > 600hp **0** 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 **Generator** Max Emission Rate for Pollutant (T/yr)	D **Load-out, Silo Filling, & Tank Storage** Emission Rate for Pollutant (T/yr)	**E POINT SOURCE TOTAL** of Max Emission Rates from A, B, & C (T/yr) Exclude Fugitives (D)
non-PAH HAPs[g]					
Bromomethane[e]				2.40E-04	0.00E+00
2-Butanone (see Methyl Ethyl Ketone)					0.00E+00
Carbon disulfide[e]				3.24E-04	0.00E+00
Chloroethane (Ethyl chloride[e])				5.24E-06	0.00E+00
Chloromethane (Methyl chloride[e])				3.74E-04	0.00E+00
Cumene				2.74E-03	0.00E+00
n-Hexane				0.00E+00	0.00E+00
Methylene chloride (Dichloromethane[e])				0.00E+00	0.00E+00
MTBE					0.00E+00
Styrene[e]				1.82E-04	0.00E+00
Tetrachloroethene (Tetrachloroethylene[e])				1.92E-04	0.00E+00
1,1,1-Trichloroethane (Methyl chloroform[e])				0.00E+00	0.00E+00
Trichloroethene (Trichloroethylene[e])				0.00E+00	0.00E+00
Trichlorofluoromethane				3.24E-05	0.00E+00
m-/p-Xylene[e]				1.02E-02	0.00E+00
o-Xylene[e]				2.00E-02	0.00E+00
Phenol[e,f]				2.41E-03	0.00E+00
Non-HAP Organic Compounds					
Methane				1.62E-01	0.00E+00

e) IDAPA Toxic Air Pollutant

Facility: **Knife River Corporation -Mountain West**

CRITERIA POLLUTANT MODELING

7/27/2020 18:52 **Permit/Facility ID:** **P-2018.0042** **777-00614**

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: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year **3,000** Tons/day 12. hr/day 4,800 hr/yr

Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil | Used Oil | Natural Gas | LPG/Propane

B. Tank Heater: **0.0000** MMBtu Rate **0** Hours/year 0.0015% S | 0.1000% S | **0** hrs/day

Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected = 0.0015% S | Natural Gas

C1. IC Engine 1: **0.00** gal/hour **0** Hours/year IC Engine < 600hp 0.0015% S #2 Fuel Oil **0** hrs/day

C2. IC Engine 2: **0.00** gal/hour **0** Hours/year IC Engine > 600hp 0.0015% S #2 Fuel Oil **0** 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)	5.75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	
PM-2.5	5.58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	
CO	32.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.37E-01	
NOx	13.75	0.00E+00	0.00E+00	0.00E+00			
SO_2	4.45	0.00E+00	0.00E+00	0.00E+00			
VOC	8.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.77E-01	
Lead	3.75E-03	0.00E+00					

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)	2.88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.52E-02	
PM-2.5	2.79	0.00E+00	0.00E+00	0	0.00E+00	6.52E-02	
CO							
NOx							
SO_2	2.23	0.00E+00	0.00E+00	0.00E+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)	3.15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-02	
PM-2.5	3.06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.15E-02	
CO							
NOx	7.53	0.00E+00	0.00	0.00			
SO_2	2.44	0.00	0.00E+00	0.00			
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: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year **3,000** Tons/day

Maximum emission for each pollutant from any fuel-burning option selected on "Facility Data" worksheet

B. Tank Heater: **0.0000** MMBtu Rated **0** Hours/year **D. Include all emissions from Load-out/Silo Filling?** **No**

Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet Short Term Source Factor 586 ELs? 1

C1. IC Engine G1: **0.00** gal/hour **0** Hours/year IC Engine <600hp #2 Fuel Oil **0** hrs/day

C2. IC Engine G2: **0.00** gal/hour **0** Hours/year IC Engine > 600hp #2 Fuel Oil **0** 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 Exceed EL Increment?	**Modeled? Meets AAC or AACC?**
HCl[e]	0.053	0.05	Exceeds	
Dioxins		**Toxic Equivalency Factor[c]**	**Adjusted Emission Rate (lb/hr)**	
2,3,7,8-TCDD	2.88E-11	1.0	2.88E-11	
Total TCDD	1.27E-10	n/a		
1,2,3,7,8-PeCDD	4.25E-11	1.0	4.25E-11	
Total PeCDD	3.01E-09	n/a		
1,2,3,4,7,8-HxCDD	5.75E-11	0.1	5.75E-12	
1,2,3,6,7,8-HxCDD	1.78E-10	0.1	1.78E-11	
1,2,3,7,8,9-HxCDD	1.34E-10	0.1	1.34E-11	
Total HxCDD	1.64E-09	n/a		
1,2,3,4,6,7,8-Hp-CDD	6.58E-10	0.01	6.58E-12	
Total HpCDD	2.60E-09	n/a		
Octa CDD	3.42E-09	0.0003	1.03E-12	
Total PCDD	1.08E-08	n/a		
Furans				
2,3,7,8-TCDF	1.33E-10	0.1	1.33E-11	
Total TCDF	5.07E-10	n/a		
1,2,3,7,8-PeCDF	5.89E-10	0.03	1.77E-11	
2,3,4,7,8-PeCDF	1.15E-10	0.3	3.45E-11	
Total PeCDF	1.15E-08	n/a		
1,2,3,4,7,8-HxCDF	5.48E-10	0.1	5.48E-11	
1,2,3,6,7,8-HxCDF	1.64E-10	0.1	1.64E-11	
2,3,4,6,7,8-HxCDF	2.60E-10	0.1	2.60E-11	
1,2,3,7,8,9-HxCDF	1.15E-09	0.1	1.15E-10	
Total HxCDF	1.78E-09	n/a		
1,2,3,4,6,7,8-HpCDF	8.90E-10	0.01	8.90E-12	
1,2,3,4,7,8,9-HpCDF	3.70E-10	0.01	3.70E-12	
Total HpCDF	1.37E-09	n/a		
Octa CDF	6.58E-10	0.0003	1.97E-13	
Total PCDF	5.48E-09	n/a		
Total PCDD/PCDF	1.64E-08	n/a		
TOTAL Dioxin/Furans[c]	Adjusted lb/hr	TAPs EL for 2,3,7,8 TCDD	**Exceeds TAPs EL?**	**Modeled?**
	4.06E-10	1.50E-10	Exceeds	
Non-PAH HAPs				
Acetaldehyde	1.78E-01	3.00E-03	Exceeds	
Acrolein	3.25E-03	0.017	No	
Benzene	5.37E-02	8.00E-04	Exceeds	
1,3-Butadiene				
Ethylbenzene	3.15E-02	29	No	
Formaldehyde	4.25E-01	5.10E-04	Exceeds	
Hexane	1.16E-01	12	No	
Isooctane	5.01E-03			
Methyl Ethyl Ketone	2.75E-03	39.3	No	
Pentane	0.00E+00	118	No	
Propionaldehyde	1.63E-02	0.0287	No	
Quinone	2.00E-02	0.027	No	
Methyl chloroform	6.00E-03	127	No	
Toluene	3.64E-01	25	No	
Xylene	3.13E-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 Exceed EL Increment?	**Modeled? Meets AAC or AACC?**
PAH HAPs				
2-Methylnaphthalene	2.44E-02	9.10E-05	Exceeds	
3-Methylchloranthrene	0.00E+00	2.50E-06	No	
Acenaphthene	3.13E-04	9.10E-05	Exceeds	
Acenaphthylene	3.03E-03	9.10E-05	Exceeds	
Anthracene	4.57E-04	9.10E-05	Exceeds	
Benzo(a)anthracene	3.76E-05			see POM
Benzo(a)pyrene	2.42E-06	2.00E-06	Exceeds	see POM
Benzo(b)fluoranthene	1.72E-05			see POM
Benzo(e)pyrene	1.87E-05	9.10E-05	No	
Benzo(g,h,l)perylene	6.37E-06	9.10E-05	No	
Benzo(k)fluoranthene	6.64E-06			see POM
Chrysene	7.28E-05			see POM
Dibenzo(a,h)anthracene	1.73E-07			see POM
Dichlorobenzene	0.00E+00	9.10E-05	No	
Fluoranthene	1.07E-04	9.10E-05	Exceeds	
Fluorene	1.87E-03	9.10E-05	Exceeds	
Indeno(1,2,3-cd)pyrene	1.18E-06			see POM
Naphthalene[e]	8.96E-02	9.10E-05	Exceeds	
Perylene	1.15E-05	9.10E-05	No	
Phenanthrene	3.53E-03	9.10E-05	Exceeds	
Pyrene	4.81E-04	9.10E-05	Exceeds	
PolycyclicOrganicMatter[d]	1.38E-04	2.00E-06	Exceeds	
Non-HAP Organic Compounds				
Acetone	1.05E-01	119	No	
Benzaldehyde	1.38E-02			
Butane	8.38E-02			
Butyraldehyde	2.00E-02			
Crotonaldehyde	1.08E-02	0.38	No	
Ethylene	8.95E-01			
Heptane	1.18E+00	109	No	
Hexanal	1.38E-02			
Isovaleraldehyde	4.00E-03			
2-Methyl-1-pentene	5.00E-01			
2-Methyl-2-butene	7.25E-02			
3-Methylpentane	2.38E-02			
1-Pentene	2.75E-01			
n-Pentane[e]	2.63E-02	118	No	
Valeraldehyde (n-Valeraldehyde)	8.38E-03	11.7	No	
Metals				
Antimony[e]	2.25E-05	0.033	No	
Arsenic	7.67E-05	1.50E-06	Exceeds	
Barium	7.25E-04	0.033	No	
Beryllium	0.00E+00	2.80E-05	No	
Cadmium	5.62E-05	3.70E-06	Exceeds	
Chromium	6.88E-04	0.033	No	
Cobalt	3.25E-06	0.0033	No	
Copper	3.88E-04	0.013	No	
Hexavalent Chromium	6.16E-05	5.60E-07	Exceeds	
Manganese	9.63E-04	0.067	No	
Mercury	3.25E-04	0.003	No	
Molybdenum	0.00E+00	0.333	No	
Nickel	8.63E-03	2.70E-05	Exceeds	
Phosphorus	3.50E-03	0.007	No	
Silver	6.00E-05	0.007	No	
Selenium	4.38E-05	0.013	No	
Thallium	5.13E-07	0.007	No	
Vanadium	0.00E+00	0.003	No	
Zinc	7.63E-03	0.667	No	

a) Reserved.

Facility:	**Knife River Corporation -Mountain West**			**TAPs MODELING**
7/27/2020 18:52	**Permit/Facility ID:**	**P-2018.0042**	**777-00614**	**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: **250** Tons/hour 8,760 Hours/year **1,200,000** Tons/year **3,000** Tons/day

Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane

B. Tank Heater: **0.0000** MMBtu Rated **0** Hours/year **0** hrs/day

Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected = Natural Gas

C1. IC Engine: **0.00** gal/hour **0** Hours/year IC Engine < 600hp #2 Fuel Oil **0** hrs/day

C2. IC Engine: **0.00** gal/hour **0** Hours/year IC Engine > 600h #2 Fuel Oil **0** 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]	5.25E-02	0.00E+00	0	0		
Dioxins[e]						
2,3,7,8-TCDD	2.88E-11		0	0		
Total TCDD	1.27E-10		0	0		
1,2,3,7,8-PeCDD	4.25E-11		0	0		
Total PeCDD	3.01E-09		0	0		
1,2,3,4,7,8-HxCDD	5.75E-11	0.00E+00	0	0		
1,2,3,6,7,8-HxCDD	1.78E-10		0	0		
1,2,3,7,8,9-HxCDD	1.34E-10	0.00E+00	0	0		
Total HxCDD	1.64E-09		0	0		
1,2,3,4,6,7,8-Hp-CDD	6.58E-10	0.00E+00	0	0		
Total HpCDD	2.60E-09	0.00E+00	0	0		
Octa CDD	3.42E-09	0.00E+00	0	0		
Total PCDD[h]	1.08E-08	0.00E+00	0	0		
Furans[e]						
2,3,7,8-TCDF	1.33E-10		0	0		
Total TCDF	5.07E-10	0.00E+00	0	0		
1,2,3,7,8-PeCDF	5.89E-10		0	0		
2,3,4,7,8-PeCDF	1.15E-10		0	0		
Total PeCDF	1.15E-08	0.00E+00	0	0		
1,2,3,4,7,8-HxCDF	5.48E-10		0	0		
1,2,3,6,7,8-HxCDF	1.64E-10		0	0		
2,3,4,6,7,8-HxCDF	2.60E-10		0	0		
1,2,3,7,8,9-HxCDF	1.15E-09		0	0		
Total HxCDF	1.78E-09	0.00E+00	0	0		
1,2,3,4,6,7,8-HpCDF	8.90E-10		0	0		
1,2,3,4,7,8,9-HpCDF	3.70E-10		0	0		
Total HpCDF	1.37E-09	0.00E+00	0	0		
Octa CDF	6.58E-10	0.00E+00	0	0		
Total PCDF[h]	5.48E-09	0.00E+00	0	0		
Total PCDD/PCDF[h]	1.64E-08	0.00E+00	0	0		
Non-PAH HAPs						
Acetaldehyde[e]	1.78E-01		0	0		
Acrolein[e]	3.25E-03		0	0		
Benzene[e]	**5.34E-02**	**0.00E+00**	0	0	**0.00E+00**	**2.96E-04**
1,3-Butadiene[e]			0	0		
Ethylbenzene[e]	3.00E-02		0	0	0.00E+00	1.46E-03
Formaldehyde[e]	**4.25E-01**	**0.00E+00**	0	0	**0.00E+00**	**5.01E-04**
Hexane[e]	1.15E-01	0.00E+00	0	0	0.00E+00	7.80E-04
Isooctane	5.00E-03		0	0	0.00E+00	9.36E-06
Methyl Ethyl Ketone[e]	2.50E-03		0	0	0.00E+00	2.55E-04
Pentane[e]		0.00E+00	0	0		
Propionaldehyde[e]	1.63E-02		0	0		
Quinone[e]	2.00E-02		0	0		
Methyl chloroform[e]	6.00E-03		0	0		
Toluene[e]	3.63E-01	0.00E+00	0	0	0.00E+00	1.09E-03
Xylene[e]	2.50E-02		0	0	0.00E+00	6.29E-03
POM (7-PAH Group)	**7.50E-05**	**0.00E+00**		**0.00E+00**	**0.00E+00**	**6.30E-05**

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	**2.33E-02**	**0.00E+00**	0	0	**0.00E+00**	**1.11E-03**
3-Methylchloranthrene[e]	**0.00E+00**	**0.00E+00**	0	0		
Acenaphthene	**1.92E-04**	**0.00E+00**	0	0	**0.00E+00**	**1.21E-04**
Acenaphthylene	**3.01E-03**	**0.00E+00**	0	0	**0.00E+00**	**1.31E-05**
Anthracene	**4.25E-04**	**0.00E+00**	0	0	**0.00E+00**	**3.27E-05**
Benzo(a)anthracene[e]	**2.88E-05**	**0.00E+00**	0	0	**0.00E+00**	**8.87E-06**
Benzo(a)pyrene[e]	**1.34E-06**	**0.00E+00**	0	0	**0.00E+00**	**1.07E-06**
Benzo(b)fluoranthene[e]	**1.37E-05**	**0.00E+00**	0	0	**0.00E+00**	**3.55E-06**
Benzo(e)pyrene	**1.51E-05**	**0.00E+00**	0	0	**0.00E+00**	**3.64E-06**
Benzo(g,h,l)perylene	**5.48E-06**	**0.00E+00**	0	0	**0.00E+00**	**8.87E-07**
Benzo(k)fluoranthene[e]	**5.62E-06**	**0.00E+00**	0	0	**0.00E+00**	**1.03E-06**
Chrysene[e]	**2.47E-05**	**0.00E+00**	0	0	**0.00E+00**	**4.81E-05**
Dibenzo(a,h)anthracene[e]	**0.00E+00**	**0.00E+00**	0	0	**0.00E+00**	**1.73E-07**
Dichlorobenzene	**0.00E+00**	**0.00E+00**	0	0		
Fluoranthene	**8.36E-05**	**0.00E+00**	0	0	**0.00E+00**	**2.34E-05**
Fluorene	**1.51E-03**	**0.00E+00**	0	0	**0.00E+00**	**3.60E-04**
Indeno(1,2,3-cd)pyrene[e]	**9.59E-07**	**0.00E+00**	0	0	**0.00E+00**	**2.20E-07**
Naphthalene[e]	**8.90E-02**	**0.00E+00**	0	0	**0.00E+00**	**5.84E-04**
Perylene	**1.21E-06**	**0.00E+00**	0	0	**0.00E+00**	**1.03E-05**
Phenanthrene	**3.15E-03**	**0.00E+00**	0	0	**0.00E+00**	**3.78E-04**
Pyrene	**4.11E-04**	**0.00E+00**	0	0	**0.00E+00**	**7.01E-05**
Non-HAP Organic Compounds						
Acetone[e]	1.04E-01	0.00E+00	0	0	8.38E-04	2.43E-04
Benzaldehyde	1.38E-02	0.00E+00	0	0		
Butane	8.38E-02	0.00E+00	0	0		
Butyraldehyde	2.00E-02	0.00E+00	0	0		
Crotonaldehyde[e]	1.08E-02	0.00E+00	0	0		
Ethylene	8.75E-01	0.00E+00	0	0	1.68E-02	3.69E-03
Heptane	1.18E+00	0.00E+00	0	0		
Hexanal	1.38E-02	0.00E+00	0	0		
Isovaleraldehyde	4.00E-03	0.00E+00	0	0		
2-Methyl-1-pentene	5.00E-01	0.00E+00	0	0		
2-Methyl-2-butene	7.25E-02	0.00E+00	0	0		
3-Methylpentane	2.38E-02	0.00E+00	0	0		
1-Pentene	2.75E-01	0.00E+00	0	0		
n-Pentane	2.63E-02	0.00E+00	0	0		
Valeraldehyde[e]	8.38E-03	0.00E+00	0	0		
Metals						
Antimony[e]	2.25E-05	0.00E+00	0	0		
Arsenic[e]	**7.67E-05**	**0.00E+00**	0	0		
Barium[e]	7.25E-04	0.00E+00	0	0		
Beryllium[e]	**0.00E+00**	**0.00E+00**	0	0		
Cadmium[e]	**5.62E-05**	**0.00E+00**	0	0		
Chromium[e]	6.88E-04	0.00E+00	0	0		
Cobalt[e]	3.25E-06	0.00E+00	0	0		
Copper[e]	3.88E-04	0.00E+00	0	0		
Hexavalent Chromium[e]	**6.16E-05**	**0.00E+00**	0	0		
Manganese[e]	9.63E-04	0.00E+00	0	0		
Mercury[e]	3.25E-04	0.00E+00	0	0		
Molybdenum[e]	0.00E+00	0.00E+00	0	0		
Nickel[e]	**8.63E-03**	**0.00E+00**	0	0		
Phosphorus[e]	3.50E-03	0.00E+00	0	0		
Silver[e]	6.00E-05	0.00E+00	0	0		
Selenium[e]	4.38E-05	0.00E+00	0	0		
Thallium[e]	5.13E-07	0.00E+00	0	0		
Vanadium[e]	0.00E+00	0.00E+00	0	0		
Zinc[e]	7.63E-03	0.00E+00	0	0		

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

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 distallate 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, natural gas and/or LPG

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 distallate 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 distallate 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 certfied 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 diference 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 "SiloFill Criteria&TAPs" Calculations
1. All PM10 is assumed to be PM2.5.
2. If emissions are routed to the drum dryer is it presumed that the particulate matter (all sizes) control efficiency of the drum dryer is 97% , and as with previous versions of this spreadsheet, it is presumed that the TAP, CO and VOC emissions changes at the drum dryer are negligible.

CURRENT PTC APPLICATION VALUES

DEQ Verification Worksheets: Hot Mix Asphalt (HMA) Drum Mix Facility Data

Facility ID/AIRS No.	777-00614	Spreadsheet Date	7/27/2020 18:59
Permit No.	P-2018.0042	DEQ Version Date	8/13/2019
Facility Owner/Company Name:	Knife River Corporation -Mountain West		
Address:	5450 West Gowen Road		
City, State, Zip:	Boise, ID 83709		
Facility Contact:	Josh Smith		
Contact Number/ e-mail:	208-407-8918/josh.smith@kniferiver.com		
		Include Silo Fill Emissions?[1]	N
		Include Loadout Emissions?[1]	Y
		1)In some cases emissions may be routed to drum dryer, if they are input "N".	

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	AESCO/Madsen	Distallate (#2) Fuel Oil	1
Rated heat input capacity, MMBtu/hr	75	Used Oil or RFO4 Oil	1
Drum Dryer Hourly HMA Production, Tons/hour	250	Natural Gas	1
Max Production Per day, Tons per day	3,000	LPG or Propane	1
Max Annual HMA Production, Tons/year	300,000	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)	1,200	#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		**Fuel Type(s)**	**Fuel Toggle**
Hours of operation per day		#2 Fuel Oil	0
Operation, days per year (DEQ Assumption)	#DIV/0!	Fuel oil sulfur content	0.0015%
Max Hours of operation per year from Form HMAP		Natural Gas	1
		LPG or Propane	1

Asphaltic Oil Tank Heater Fuel Consumption Calculations	**#2 Fuel Oil**	**Natural Gas**
Heat Input Rating, MMBtu/hr	0.000	0.000
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]	0.00	0
Max Operational Hours per Year	0	0
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)			
IC Engine Make/Model		**Fuel Type(s)**	**IC Engine Toggle**
IC Engine Year Manufactured (yyyy)		#2 Fuel Oil (Diesel)	1
IC Engine Max Rated Power (bhp)		Max Sulfur weight percentage	0.0015%
IC Engine Max Rated Capacity (kW)	0	Max Operational Hours/Day	
		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 I, Tier 2, Tier 3, or Tier 4: Enter 1, 2, 3, or 4 Certified "BLUE SKY" engine: Enter 5			

ERROR - IC ENGINE 2 RATING IS LESS THAN 600 bhp

IC Engine 2 > 600 bhp (447 kW) AP-42 Section 3.4 (diesel fueled)			
IC Engine Make/Model		**Fuel Type(s)**	**IC Engine Toggle**
IC Engine Year Manufactured (yyyy)		#2 Fuel Oil (Diesel)	1
IC Engine Rated Capacity (bhp)		Max Sulfur weight percentage	0.0015%
IC Engine Max Rated Capacity (kW)	0	Max Operational Hours per Day	
		Max Operational Hours per Year	
IC Engine 2 EPA Certification:		Calculated Max Fuel Use Rate, gal/hr	0.00
Not EPA-certified: Enter "0" (zero)		Calculated MMBtu/hr	0.00
Certified Tier I, 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 conveyor t
M = moisture content (%)	3	Bulk aggregate for HMAstypically 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% contr
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

Facility: **Knife River Corporation -Mountain West**
7/27/2020 18:59 **Permit/Facility ID:** **P-2018.0042** **777-00614**

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

Fuel Type Toggle =	1	
Max Hourly Production	250	T/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	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	8.25	4.95	
PM-10 (total) [b]	0.023	5.75	3.45	
PM-2.5 [b1]	0.0223	5.58	3.35	
CO [c]	0.13	32.50	19.50	
NOx [c]	0.055	13.75	8.25	
SO_2 [c]	0.089	4.45	2.67	
VOC [d]	0.032	8.00	4.80	
Lead	1.50E-05	3.75E-03	2.25E-03	
HCl [d,e]	0.00021	0.0525	3.15E-02	
Dioxins[e,f]				
2,3,7,8-TCDD	2.10E-13	5.25E-11	3.15E-11	**7.19E-12**
Total TCDD	9.30E-13	2.33E-10	1.40E-10	**3.18E-11**
1,2,3,7,8-PeCDD	3.10E-13	7.75E-11	4.65E-11	**1.06E-11**
Total PeCDD	2.20E-11	5.50E-09	3.30E-09	**7.53E-10**
1,2,3,4,7,8-HxCDD	4.20E-13	1.05E-10	6.30E-11	**1.44E-11**
1,2,3,6,7,8-HxCDD	1.30E-12	3.25E-10	1.95E-10	**4.45E-11**
1,2,3,7,8,9-HxCDD	9.80E-13	2.45E-10	1.47E-10	**3.36E-11**
Total HxCDD	1.20E-11	3.00E-09	1.80E-09	**4.11E-10**
1,2,3,4,6,7,8-Hp-CDD	4.80E-12	1.20E-09	7.20E-10	**1.64E-10**
Total HpCDD	1.90E-11	4.75E-09	2.85E-09	**6.51E-10**
Octa CDD	2.50E-11	6.25E-09	3.75E-09	**8.56E-10**
Total PCDD[h]	7.90E-11	1.98E-08	1.19E-08	**2.71E-09**
Furans[e,f]				
2,3,7,8-TCDF	9.70E-13	2.43E-10	1.46E-10	**3.32E-11**
Total TCDF	3.70E-12	9.25E-10	5.55E-10	**1.27E-10**
1,2,3,7,8-PeCDF	4.30E-12	1.08E-09	6.45E-10	**1.47E-10**
2,3,4,7,8-PeCDF	8.40E-13	2.10E-10	1.26E-10	**2.88E-11**
Total PeCDF	8.40E-11	2.10E-08	1.26E-08	**2.88E-09**
1,2,3,4,7,8-HxCDF	4.00E-12	1.00E-09	6.00E-10	**1.37E-10**
1,2,3,6,7,8-HxCDF	1.20E-12	3.00E-10	1.80E-10	**4.11E-11**
2,3,4,6,7,8-HxCDF	1.90E-12	4.75E-10	2.85E-10	**6.51E-11**
1,2,3,7,8,9-HxCDF	8.40E-12	2.10E-09	1.26E-09	**2.88E-10**
Total HxCDF	1.30E-11	3.25E-09	1.95E-09	**4.45E-10**
1,2,3,4,6,7,8-HpCDF	6.50E-12	1.63E-09	9.75E-10	**2.23E-10**
1,2,3,4,7,8,9-HpCDF	2.70E-12	6.75E-10	4.05E-10	**9.25E-11**
Total HpCDF	1.00E-11	2.50E-09	1.50E-09	**3.42E-10**
Octa CDF	4.80E-12	1.20E-09	7.20E-10	**1.64E-10**
Total PCDF[h]	4.00E-11	1.00E-08	6.00E-09	**1.37E-09**
Total PCDD/PCDF[h]	1.20E-10	3.00E-08	1.80E-08	**4.11E-09**
Non-PAH HAPs[f]				
Acetaldehyde[e]	1.30E-03	3.25E-01	1.95E-01	**4.45E-02**
Acrolein[e]	2.60E-05	6.50E-03	3.90E-03	3.25E-03
Benzene[e]	3.90E-04	9.75E-02	5.85E-02	**1.34E-02**
1,3-Butadiene[e]				
Ethylbenzene[e]	2.40E-04	6.00E-02	3.60E-02	3.00E-02
Formaldehyde[e]	3.10E-03	7.75E-01	4.65E-01	**1.06E-01**
Hexane[e]	9.20E-04	2.30E-01	1.38E-01	1.15E-01
Isooctane	4.00E-05	1.00E-02	6.00E-03	5.00E-03
Methyl Ethyl Ketone[e]	2.00E-05	5.00E-03	3.00E-03	2.50E-03
Pentane[e]				
Propionaldehyde[e]	1.30E-04	3.25E-02	1.95E-02	1.63E-02
Quinone[e]	1.60E-04	4.00E-02	2.40E-02	2.00E-02
Methyl chloroform[e]	4.80E-05	1.20E-02	7.20E-03	6.00E-03
Toluene[e]	2.90E-03	7.25E-01	4.35E-01	3.63E-01
Xylene[e]	2.00E-04	5.00E-02	3.00E-02	2.50E-02
POM (7-PAH Group)		1.37E-04		**1.88E-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	4.25E-02	2.55E-02	**5.82E-03**
3-Methylchloranthrene[e]				
Acenaphthene	1.40E-06	3.50E-04	2.10E-04	**4.79E-05**
Acenaphthylene	2.20E-05	5.50E-03	3.30E-03	**7.53E-04**
Anthracene	3.10E-06	7.75E-04	4.65E-04	**1.06E-04**
Benzo(a)anthracene	2.10E-07	5.25E-05	3.15E-05	**7.19E-06**
Benzo(a)pyrene[e]	9.80E-09	2.45E-06	1.47E-06	**3.36E-07**
Benzo(b)fluoranthene	1.00E-07	2.50E-05	1.50E-05	**3.42E-06**
Benzo(e)pyrene	1.10E-07	2.75E-05	1.65E-05	**3.77E-06**
Benzo(g,h,i)perylene	4.00E-08	1.00E-05	6.00E-06	**1.37E-06**
Benzo(k)fluoranthene	4.10E-08	1.03E-05	6.15E-06	**1.40E-06**
Chrysene	1.80E-07	4.50E-05	2.70E-05	**6.16E-06**
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene	6.10E-07	1.53E-04	9.15E-05	**2.09E-05**
Fluorene	1.10E-05	2.75E-03	1.65E-03	**3.77E-04**
Indeno(1,2,3-cd)pyrene	7.00E-09	1.75E-06	1.05E-06	**2.40E-07**
Naphthalene[e]	6.50E-04	1.63E-01	9.75E-02	**2.23E-02**
Perylene	8.80E-09	2.20E-06	1.32E-06	**3.01E-07**
Phenanthrene	2.30E-05	5.75E-03	3.45E-03	**7.88E-04**
Pyrene	3.00E-06	7.50E-04	4.50E-04	**1.03E-04**
Non-HAP Organic Compounds[f]				
Acetone[e]	8.30E-04	2.08E-01	1.25E-01	1.04E-01
Benzaldehyde	1.10E-04	2.75E-02	1.65E-02	1.38E-02
Butane	6.70E-04	1.68E-01	1.01E-01	8.38E-02
Butyraldehyde	1.60E-04	4.00E-02	2.40E-02	2.00E-02
Crotonaldehyde[e]	8.60E-05	2.15E-02	1.29E-02	1.08E-02
Ethylene	7.00E-03	1.75E+00	1.05E+00	8.75E-01
Heptane	9.40E-03	2.35E+00	1.41E+00	1.18E+00
Hexanal	1.10E-04	2.75E-02	1.65E-02	1.38E-02
Isovaleraldehyde	3.20E-05	8.00E-03	4.80E-03	4.00E-03
2-Methyl-1-pentene	4.00E-03	1.00E+00	6.00E-01	5.00E-01
2-Methyl-2-butene	5.80E-04	1.45E-01	8.70E-02	7.25E-02
3-Methylpentane	1.90E-04	4.75E-02	2.85E-02	2.38E-02
1-Pentene	2.20E-03	5.50E-01	3.30E-01	2.75E-01
n-Pentane	2.10E-04	5.25E-02	3.15E-02	2.63E-02
Valeraldehyde[e]	6.70E-05	1.68E-02	1.01E-02	8.38E-03
Metals[g]				
Antimony[e]	1.80E-07	4.50E-05	2.70E-05	2.25E-05
Arsenic[e]	5.60E-07	1.40E-04	8.40E-05	**1.92E-05**
Barium[e]	5.80E-06	1.45E-03	8.70E-04	7.25E-04
Beryllium[e]				
Cadmium[e]	4.10E-07	1.03E-04	6.15E-05	**1.40E-05**
Chromium[e]	5.50E-06	1.38E-03	8.25E-04	6.88E-04
Cobalt[e]	2.60E-08	6.50E-06	3.90E-06	3.25E-06
Copper[e]	3.10E-06	7.75E-04	4.65E-04	3.88E-04
Hexavalent Chromium[e]	4.50E-07	1.13E-04	6.75E-05	**1.54E-05**
Manganese[e]	7.70E-06	1.93E-03	1.16E-03	9.63E-04
Mercury[e]	2.60E-06	6.50E-04	3.90E-04	3.25E-04
Molybdenum[e]				
Nickel[e]	6.30E-05	1.58E-02	9.45E-03	**2.16E-03**
Phosphorus[e]	2.80E-05	7.00E-03	4.20E-03	3.50E-03
Silver[e]	4.80E-07	1.20E-04	7.20E-05	6.00E-05
Selenium[e]	3.50E-07	8.75E-05	5.25E-05	4.38E-05
Thallium[e]	4.10E-09	1.03E-06	6.15E-07	5.13E-07
Vanadium[e]				
Zinc[e]	6.10E-05	1.53E-02	9.15E-03	7.63E-03

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 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**
7/27/2020 18:59 **Permit/ Facility ID: P-2018.0042 777-00614**

Natural Gas Fired Drum Mix Asphalt Plant With Fabric Filter AP-42 Section 11.1

Fuel Type Toggle =	1	
Max Hourly Production	250	Tons/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	Tons/yr (Proposed Throughput Limit)

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	8.25	4.95	
PM-10 (total)[b]	0.023	5.75	3.45	
PM-2.5 [b1]	0.0223	5.58	3.35	
CO [c]	0.13	32.50	19.50	
NOx [c]	0.026	6.50	3.90	
SO_2 [c]	0.0034	0.85	0.51	
VOC [d]	0.032	8.00	4.80	
Lead	6.20E-07	1.55E-04	9.30E-05	
HCl [d,e]	No Data			
Dioxins[e]				
-- No EFs for Natural Gas Fuel --				
Furans[e]				
-- No EFs for Natural Gas Fuel --				
Non-PAH HAPs[f]				
Acetaldehyde[e]				
Acrolein[e]				
Benzene[e]	3.90E-04	9.75E-02	5.85E-02	**1.34E-02**
1,3-Butadiene[e]				
Ethylbenzene[e]	2.40E-04	6.00E-02	3.60E-02	3.00E-02
Formaldehyde[e]	3.10E-03	7.75E-01	4.65E-01	**1.06E-01**
Hexane[e]	9.20E-04	2.30E-01	1.38E-01	1.15E-01
Isooctane	4.00E-05	1.00E-02	6.00E-03	5.00E-03
Methyl Ethyl Ketone[e]				
Pentane[e]				
Propionaldehyde[e]				
Quinone[e]				
Methyl chloroform[e]	4.80E-05	1.20E-02	7.20E-03	6.00E-03
Toluene[e]	1.50E-04	3.75E-02	2.25E-02	1.88E-02
Xylene[e]	2.00E-04	5.00E-02	3.00E-02	2.50E-02
POM (7-PAH Group)		2.84E-02		**3.89E-03**

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	7.40E-05	1.85E-02	1.11E-02	**2.53E-03**
3-Methylchloranthrene[e]				
Acenaphthene	1.40E-06	3.50E-04	2.10E-04	**4.79E-05**
Acenaphthylene	8.60E-06	2.15E-03	1.29E-03	**2.95E-04**
Anthracene	2.20E-07	5.50E-05	3.30E-05	**7.53E-06**
Benzo(a)anthracene	2.10E-07	5.25E-05	3.15E-05	**7.19E-06**
Benzo(a)pyrene[e]	9.80E-09	2.45E-06	1.47E-06	**3.36E-07**
Benzo(b)fluoranthene	1.00E-07	2.50E-05	1.50E-05	**3.42E-06**
Benzo(e)pyrene	1.10E-07	2.75E-05	1.65E-05	**3.77E-06**
Benzo(g,h,l)perylene	4.00E-08	1.00E-05	6.00E-06	**1.37E-06**
Benzo(k)fluoranthene	4.10E-08	1.03E-05	6.15E-06	**1.40E-06**
Chrysene	1.80E-07	4.50E-05	2.70E-05	**6.16E-06**
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene	6.10E-07	1.53E-04	9.15E-05	**2.09E-05**
Fluorene	3.80E-06	9.50E-04	5.70E-04	**1.30E-04**
Indeno(1,2,3-cd)pyrene	7.00E-09	1.75E-06	1.05E-06	**2.40E-07**
Naphthalene[e]	9.00E-05	2.25E-02	1.35E-02	**3.08E-03**
Perylene	8.80E-09	2.20E-06	1.32E-06	**3.01E-07**
Phenanthrene	7.60E-06	1.90E-03	1.14E-03	**2.60E-04**
Pyrene	5.40E-07	1.35E-04	8.10E-05	**1.85E-05**
Non-HAPs Organic Compounds[f]				
Acetone[e]				
Benzaldehyde				
Butane	6.70E-04	1.68E-01	1.01E-01	8.38E-02
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene	7.00E-03	1.75E+00	1.05E+00	8.75E-01
Heptane	9.40E-03	2.35E+00	1.41E+00	1.18E+00
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene	4.00E-03	1.00E+00	6.00E-01	5.00E-01
2-Methyl-2-butene	5.80E-04	1.45E-01	8.70E-02	7.25E-02
3-Methylpentane	1.90E-04	4.75E-02	2.85E-02	2.38E-02
1-Pentene	2.20E-03	5.50E-01	3.30E-01	2.75E-01
n-Pentane	2.10E-04	5.25E-02	3.15E-02	2.63E-02
Valeraldehyde				
Metals[g]				
Antimony[e]	1.80E-07	4.50E-05	2.70E-05	2.25E-05
Arsenic[e]	5.60E-07	1.40E-04	8.40E-05	**1.92E-05**
Barium[e]	5.80E-06	1.45E-03	8.70E-04	7.25E-04
Beryllium[e]				
Cadmium[e]	4.10E-07	1.03E-04	6.15E-05	**1.40E-05**
Chromium[e]	5.50E-06	1.38E-03	8.25E-04	6.88E-04
Cobalt[e]	2.60E-08	6.50E-06	3.90E-06	3.25E-06
Copper[e]	3.10E-06	7.75E-04	4.65E-04	3.88E-04
Hexavalent Chromium[e]	4.50E-07	1.13E-04	6.75E-05	**1.54E-05**
Manganese[e]	7.70E-06	1.93E-03	1.16E-03	9.63E-04
Mercury[e]	2.40E-07	6.00E-05	3.60E-05	3.00E-05
Molybdenum[e]				
Nickel[e]	6.30E-05	1.58E-02	9.45E-03	**2.16E-03**
Phosphorus[e]	2.80E-05	7.00E-03	4.20E-03	3.50E-03
Silver[e]	4.80E-07	1.20E-04	7.20E-05	6.00E-05
Selenium[e]	3.50E-07	8.75E-05	5.25E-05	4.38E-05
Thallium[e]	4.10E-09	1.03E-06	6.15E-07	5.13E-07
Vanadium[e]				
Zinc[e]	6.10E-05	1.53E-02	9.15E-03	7.63E-03

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
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

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**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

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

Fuel Type Toggle =	1	
Hourly Production	250	T/hr
Daily Production	3,000	Tons/day
Max Annual Production	300,000	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	8.25	4.95	
PM-10 (total) [b]	0.023	5.75	3.45	
PM-2.5 [b1]	0.0223	5.58	3.35	
CO [c]	0.13	32.50	19.50	
NOx [c]	0.055	13.75	8.25	
SO_2 [c]	0.089	0.07	0.04	
VOC [d]	0.032	8.00	4.80	
Lead	1.50E-05	3.75E-03	2.25E-03	
HCl [d,e]	No Data			
Dioxins[e]				
2,3,7,8-TCDD	2.10E-13	5.25E-11	3.15E-11	**7.19E-12**
Total TCDD	9.30E-13	2.33E-10	1.40E-10	**3.18E-11**
1,2,3,7,8-PeCDD	3.10E-13	7.75E-11	4.65E-11	**1.06E-11**
Total PeCDD	2.20E-11	5.5E-09	3.30E-09	**7.53E-10**
1,2,3,4,7,8-HxCDD	4.20E-13	1.05E-10	6.30E-11	**1.44E-11**
1,2,3,6,7,8-HxCDD	1.30E-12	3.25E-10	1.95E-10	**4.45E-11**
1,2,3,7,8,9-HxCDD	9.80E-13	2.45E-10	1.47E-10	**3.36E-11**
Total HxCDD	1.20E-11	3E-09	1.80E-09	**4.11E-10**
1,2,3,4,6,7,8-Hp-CDD	4.80E-12	1.2E-09	7.20E-10	**1.64E-10**
Total HpCDD	1.90E-11	4.75E-09	2.85E-09	**6.51E-10**
Octa CDD	2.50E-11	6.25E-09	3.75E-09	**8.56E-10**
Total PCDD[h]	7.90E-11	1.98E-08	1.19E-08	**2.71E-09**
Furans[e]				
2,3,7,8-TCDF	9.70E-13	2.43E-10	1.46E-10	**3.32E-11**
Total TCDF	3.70E-12	9.25E-10	5.55E-10	**1.27E-10**
1,2,3,7,8-PeCDF	4.30E-12	1.08E-09	6.45E-10	**1.47E-10**
2,3,4,7,8-PeCDF	8.40E-13	2.1E-10	1.26E-10	**2.88E-11**
Total PeCDF	8.40E-11	2.1E-08	1.26E-08	**2.88E-09**
1,2,3,4,7,8-HxCDF	4.00E-12	1E-09	6.00E-10	**1.37E-10**
1,2,3,6,7,8-HxCDF	1.20E-12	3E-10	1.80E-10	**4.11E-11**
2,3,4,6,7,8-HxCDF	1.90E-12	4.75E-10	2.85E-10	**6.51E-11**
1,2,3,7,8,9-HxCDF	8.40E-12	2.1E-09	1.26E-09	**2.88E-10**
Total HxCDF	1.30E-11	3.25E-09	1.95E-09	**4.45E-10**
1,2,3,4,6,7,8-HpCDF	6.50E-12	1.63E-09	9.75E-10	**2.23E-10**
1,2,3,4,7,8,9-HpCDF	2.70E-12	6.75E-10	4.05E-10	**9.25E-11**
Total HpCDF	1.00E-11	2.5E-09	1.50E-09	**3.42E-10**
Octa CDF	4.80E-12	1.2E-09	7.20E-10	**1.64E-10**
Total PCDF[h]	4.00E-11	1E-08	6.00E-09	**1.37E-09**
Total PCDD/PCDF[h]	1.20E-10	3E-08	1.80E-08	**4.11E-09**
Non-PAH HAPs[f]				
Acetaldehyde[e]				
Acrolein[e]				
Benzene[e]	3.90E-04	9.75E-02	5.85E-02	**1.34E-02**
1,3-Butadiene[e]				
Ethylbenzene[e]	2.40E-04	6.00E-02	3.60E-02	3.00E-02
Formaldehyde[e]	3.10E-03	7.75E-01	4.65E-01	**1.06E-01**
Hexane[e]	9.20E-04	2.30E-01	1.38E-01	1.15E-01
Isooctane	4.00E-05	1.00E-02	6.00E-03	5.00E-03
Methyl Ethyl Ketone[e]				
Pentane[e]				
Propionaldehyde[e]				
Quinone[e]				
Methyl chloroform[e]	4.80E-05	1.20E-02	7.20E-03	6.00E-03
Toluene[e]	2.90E-03	7.25E-01	4.35E-01	3.63E-01
Xylene[e]	2.00E-04	5.00E-02	3.00E-02	2.50E-02
POM (7-PAH Group)		1.37E-04		**1.88E-05**

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	4.25E-02	2.55E-02	**5.82E-03**
3-Methylchloranthrene[e]				
Acenaphthene	1.40E-06	3.50E-04	2.10E-04	**4.79E-05**
Acenaphthylene	2.20E-05	5.50E-03	3.30E-03	**7.53E-04**
Anthracene	3.10E-06	7.75E-04	4.65E-04	**1.06E-04**
Benzo(a)anthracene	2.10E-07	5.25E-05	3.15E-05	**7.19E-06**
Benzo(a)pyrene[e]	9.80E-09	2.45E-06	1.47E-06	**3.36E-07**
Benzo(b)fluoranthene	1.00E-07	2.50E-05	1.50E-05	**3.42E-06**
Benzo(e)pyrene	1.10E-07	2.75E-05	1.65E-05	**3.77E-06**
Benzo(g,h,I)perylene	4.00E-08	1.00E-05	6.00E-06	**1.37E-06**
Benzo(k)fluoranthene	4.10E-08	1.03E-05	6.15E-06	**1.40E-06**
Chrysene	1.80E-07	4.50E-05	2.70E-05	**6.16E-06**
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene	6.10E-07	1.53E-04	9.15E-05	**2.09E-05**
Fluorene	1.10E-05	2.75E-03	1.65E-03	**3.77E-04**
Indeno(1,2,3-cd)pyrene	7.00E-09	1.75E-06	1.05E-06	**2.40E-07**
Naphthalene[e]	0.00065	1.63E-01	9.75E-02	**2.23E-02**
Perylene	8.80E-09	2.20E-06	1.32E-06	**3.01E-07**
Phenanthrene	2.30E-05	5.75E-03	3.45E-03	**7.88E-04**
Pyrene	3.00E-06	7.50E-04	4.50E-04	**1.03E-04**
Non-HAP Organic Compounds[f]				
Acetone[e]				
Benzaldehyde				
Butane	6.70E-04	1.68E-01	1.01E-01	8.38E-02
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene	7.00E-03	1.75E+00	1.05E+00	8.75E-01
Heptane	9.40E-03	2.35E+00	1.41E+00	1.18E+00
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene	4.00E-03	1.00E+00	6.00E-01	5.00E-01
2-Methyl-2-butene	5.80E-04	1.45E-01	8.70E-02	7.25E-02
3-Methylpentane	1.90E-04	4.75E-02	2.85E-02	2.38E-02
1-Pentene	2.20E-03	5.50E-01	3.30E-01	2.75E-01
n-Pentane	2.10E-04	5.25E-02	3.15E-02	2.63E-02
Valeraldehyde				
Metals[g]				
Antimony[e]	1.80E-07	4.50E-05	2.70E-05	2.25E-05
Arsenic[e]	5.60E-07	1.40E-04	8.40E-05	**1.92E-05**
Barium[e]	5.80E-06	1.45E-03	8.70E-04	7.25E-04
Beryllium[e]				
Cadmium[e]	4.10E-07	1.03E-04	6.15E-05	**1.40E-05**
Chromium[e]	5.50E-06	1.38E-03	8.25E-04	6.88E-04
Cobalt[e]	2.60E-08	6.50E-06	3.90E-06	3.25E-06
Copper[e]	3.10E-06	7.75E-04	4.65E-04	3.88E-04
Hexavalent Chromium[e]	4.50E-07	1.13E-04	6.75E-05	**1.54E-05**
Manganese[e]	7.70E-06	1.93E-03	1.16E-03	9.63E-04
Mercury[e]	2.60E-06	6.50E-04	3.90E-04	3.25E-04
Molybdenum[e]				
Nickel[e]	6.30E-05	1.58E-02	9.45E-03	**2.16E-03**
Phosphorus[e]	2.80E-05	7.00E-03	4.20E-03	3.50E-03
Silver[e]	4.80E-07	1.20E-04	7.20E-05	6.00E-05
Selenium[e]	3.50E-07	8.75E-05	5.25E-05	4.38E-05
Thallium[e]	4.10E-09	1.03E-06	6.15E-07	5.13E-07
Vanadium[e]				
Zinc[e]	6.10E-05	1.53E-02	9.15E-03	7.63E-03

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 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.

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**
7/27/2020 18:59 **Permit/ Facility ID: P-2018.0042 777-00614**

LPG or Propane Fired Drum Mix Asphalt Plant With Fabric Filter

Fuel Type Toggle =	1	
Max Hourly Production	250	Tons/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	Tons/yr

Note: Presumes same emissions as natural gas except for NOx
(see AP-42, Section 1.5, Liquefied Petroleum Gas Combustion)
SO2 emissions from natural gas are ~70% lower than with #2 Fuel Oil, and ~94%
lower than with Used Oil or #6 Fuel Oil (minimal impact on emissions, used Nat Gas EF)

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	8.25	4.95	
PM-10 (total)[b]	0.023	5.75	3.45	
PM-2.5 [b1]	0.0223	5.58	3.35	
CO [c]	0.13	32.50	19.50	
NOx [c1] (Natural Gas EF x 1.5)	0.039	9.75	5.85	
SO_2 [c]	0.0034	0.85	0.51	
VOC [d]	0.032	8.00	4.80	
Lead	6.20E-07	0.000155	9.30E-05	
HCl [d,e]	No Data			
Dioxins[e]				
-- No EFs for LP Gas or Propane Fuel --				
Furans[e]				
-- No EFs for LP Gas or Propane Fuel --				
Non-PAH HAPs[f]				
Acetaldehyde[e]				
Acrolein[e]				
Benzene[e]	3.90E-04	9.75E-02	5.85E-02	**1.34E-02**
1,3-Butadiene[e]				
Ethylbenzene[e]	2.40E-04	6.00E-02	3.60E-02	3.00E-02
Formaldehyde[e]	3.10E-03	7.75E-01	4.65E-01	**1.06E-01**
Hexane[e]	9.20E-04	2.30E-01	1.38E-01	1.15E-01
Isooctane	4.00E-05	1.00E-02	6.00E-03	5.00E-03
Methyl Ethyl Ketone[e]				
Pentane[e]				
Propionaldehyde[e]				
Quinone[e]				
Methyl chloroform[e]	4.80E-05	1.20E-02	7.20E-03	6.00E-03
Toluene[e]	1.50E-04	3.75E-02	2.25E-02	1.88E-02
Xylene[e]	2.00E-04	5.00E-02	3.00E-02	2.50E-02
POM (7-PAH Group)		1.37E-04		**1.88E-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	7.40E-05	1.85E-02	1.11E-02	**2.53E-03**
3-Methylchloranthrene[e]				
Acenaphthene	1.40E-06	3.50E-04	2.10E-04	**4.79E-05**
Acenaphthylene	8.60E-06	2.15E-03	1.29E-03	**2.95E-04**
Anthracene	2.20E-07	5.50E-05	3.30E-05	**7.53E-06**
Benzo(a)anthracene	2.10E-07	5.25E-05	3.15E-05	**7.19E-06**
Benzo(a)pyrene[e]	9.80E-09	2.45E-06	1.47E-06	**3.36E-07**
Benzo(b)fluoranthene	1.00E-07	2.50E-05	1.50E-05	**3.42E-06**
Benzo(e)pyrene	1.10E-07	2.75E-05	1.65E-05	**3.77E-06**
Benzo(g,h,l)perylene	4.00E-08	1.00E-05	6.00E-06	**1.37E-06**
Benzo(k)fluoranthene	4.10E-08	1.03E-05	6.15E-06	**1.40E-06**
Chrysene	1.80E-07	4.50E-05	2.70E-05	**6.16E-06**
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene	6.10E-07	1.53E-04	9.15E-05	**2.09E-05**
Fluorene	3.80E-06	9.50E-04	5.70E-04	**1.30E-04**
Indeno(1,2,3-cd)pyrene	7.00E-09	1.75E-06	1.05E-06	**2.40E-07**
Naphthalene[e]	9.00E-05	2.25E-02	1.35E-02	**3.08E-03**
Perylene	8.80E-09	2.20E-06	1.32E-06	**3.01E-07**
Phenanthrene	7.60E-06	1.90E-03	1.14E-03	**2.60E-04**
Pyrene	5.40E-07	1.35E-04	8.10E-05	**1.85E-05**
Non-HAPs Organic Compounds[f]				
Acetone[e]				
Benzaldehyde				
Butane	6.70E-04	1.68E-01	1.01E-01	8.38E-02
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene	7.00E-03	1.75E+00	1.05E+00	8.75E-01
Heptane	9.40E-03	2.35E+00	1.41E+00	1.18E+00
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene	4.00E-03	1.00E+00	6.00E-01	5.00E-01
2-Methyl-2-butene	5.80E-04	1.45E-01	8.70E-02	7.25E-02
3-Methylpentane	1.90E-04	4.75E-02	2.85E-02	2.38E-02
1-Pentene	2.20E-03	5.50E-01	3.30E-01	2.75E-01
n-Pentane	2.10E-04	5.25E-02	3.15E-02	2.63E-02
Valeraldehyde				
Metals[g]				
Antimony[e]	1.80E-07	4.50E-05	2.70E-05	2.25E-05
Arsenic[e]	5.60E-07	1.40E-04	8.40E-05	**1.92E-05**
Barium[e]	5.80E-06	1.45E-03	8.70E-04	7.25E-04
Beryllium[e]				
Cadmium[e]	4.10E-07	1.03E-04	6.15E-05	**1.40E-05**
Chromium[e]	5.50E-06	1.38E-03	8.25E-04	6.88E-04
Cobalt[e]	2.60E-08	6.50E-06	3.90E-06	3.25E-06
Copper[e]	3.10E-06	7.75E-04	4.65E-04	3.88E-04
Hexavalent Chromium[e]	4.50E-07	1.13E-04	6.75E-05	**1.54E-05**
Manganese[e]	7.70E-06	1.93E-03	1.16E-03	9.63E-04
Mercury[e]	2.40E-07	6.00E-05	3.60E-05	3.00E-05
Molybdenum[e]				
Nickel[e]	6.30E-05	1.58E-02	9.45E-03	**2.16E-03**
Phosphorus[e]	2.80E-05	7.00E-03	4.20E-03	3.50E-03
Silver[e]	4.80E-07	1.20E-04	7.20E-05	6.00E-05
Selenium[e]	3.50E-07	8.75E-05	5.25E-05	4.38E-05
Thallium[e]	4.10E-09	1.03E-06	6.15E-07	5.13E-07
Vanadium[e]				
Zinc[e]	6.10E-05	1.53E-02	9.15E-03	7.63E-03

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
c1) AP-42, Table 1.5-1, Emission Factors for LPG Combustion, note (a): "Assumes emissions (except SOx and NOx) are the same, on a heat input basis, as for natural gas combustion. The NOx emission factors have been multiplied by a factor of 1.5, which is the approximate ration of propane/butane NOx emissions to natural gas NOx emissions.
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

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**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

Silo Filling Operations AP-42 Section 11.1

Emissions Toggle =	0	
Max Hourly Production	250	T/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	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	0.0000	0.0000	
PM-10 (total) [b]	5.86E-04	0.0000	0.0000	
PM-2.5 [b]	5.86E-04	0.0000	0.0000	
CO [b]	1.18E-03	0.0000	0.0000	
NOx				
SO_2				
VOC [d,g]	1.22E-04	0.00E+00	0.0000	
Lead				
HCl [d,e]	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-Hp-CDD				
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	0.00E+00	0.00E+00	0.0000
1,3-Butadiene[e]				
Ethylbenzene[e]	4.63E-06	0.00E+00	0.00E+00	0.0000
Formaldehyde[e]	8.41E-05	0.00E+00	0.00E+00	0.0000
Hexane[e]	1.22E-05	0.00E+00	0.00E+00	0.0000
Isooctane	3.78E-08	0.00E+00	0.00E+00	0.0000
Methyl Ethyl Ketone[e]	4.75E-06	0.00E+00	0.00E+00	0.0000
Pentane[e]				
Propionaldehyde[e]				
Quinone[e]				
Methyl chloroform[e]		0.00E+00	0.00E+00	
Toluene[e]	7.56E-06	0.00E+00	0.00E+00	0.0000
Xylene[e]	3.13E-05	0.00E+00	0.00E+00	0.0000
POM (7-PAH Group)		0.00E+00		0.0000

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 HAPs[f]				
2-Methylnaphthalene	1.34E-05	0.00E+00	0.0000E+00	0.00E+00
3-Methylchloranthrene[e]				
Acenaphthene	1.19E-06	0.00E+00	0.0000E+00	0.00E+00
Acenaphthylene	3.55E-08	0.00E+00	0.0000E+00	0.00E+00
Anthracene	3.30E-07	0.00E+00	0.0000E+00	0.00E+00
Benzo(a)anthracene	1.42E-07	0.00E+00	0.0000E+00	0.00E+00
Benzo(a)pyrene[e]	0.00E+00	0.00E+00	0.0000E+00	0.00E+00
Benzo(b)fluoranthene	0.00E+00	0.00E+00	0.0000E+00	0.00E+00
Benzo(e)pyrene	2.41E-08	0.00E+00	0.0000E+00	0.00E+00
Benzo(g,h,I)perylene	0.00E+00	0.00E+00	0.0000E+00	0.00E+00
Benzo(k)fluoranthene	0.00E+00	0.00E+00	0.0000E+00	0.00E+00
Chrysene	5.33E-07	0.00E+00	0.0000E+00	0.00E+00
Dibenzo(a,h)anthracene	0.00E+00	0.00E+00	0.0000E+00	0.00E+00
Dichlorobenzene				
Fluoranthene	3.81E-07	0.00E+00	0.0000E+00	0.00E+00
Fluorene	2.56E-06	0.00E+00	0.0000E+00	0.00E+00
Indeno(1,2,3-cd)pyrene	0.00E+00	0.00E+00	0.0000E+00	0.00E+00
Naphthalene[e]	4.62E-06	0.00E+00	0.0000E+00	0.00E+00
Perylene	7.62E-08	0.00E+00	0.0000E+00	0.00E+00
Phenanthrene	4.57E-06	0.00E+00	0.0000E+00	0.00E+00
Pyrene	1.12E-06	0.00E+00	0.0000E+00	0.00E+00
Non-HAP Organic Compounds				
Acetone[e]	6.70E-06	0.00E+00	0.0000E+00	8.38E-04
Benzaldehyde				
Butane				
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene	1.34E-04	0.00E+00	0.0000E+00	1.68E-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 (^{o}F) = 325

		LOADOUT	SILO FILL	
Total PM EF = $0.000181+0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ + $000332+ 0.00105(-V)e^{((0.0251)(T+460)-20.}$	=	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**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

Silo Filling Operations AP-42 Section 11.1, Page 2

Fuel Type Toggle =	1	
Max Hourly Production	250	T/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	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
non-PAH HAPs[g]				
Bromomethane[e]	5.97E-07	0.00E+00	0.00E+00	0.00E+00
2-Butanone (see Methyl Ethyl Ketone)				
Carbon disulfide[e]	1.95E-06	0.00E+00	0.00E+00	0.00E+00
Chloroethane (Ethyl chloride[e])	4.87E-07	0.00E+00	0.00E+00	0.00E+00
Chloromethane (Methyl chloride[e])	2.80E-06	0.00E+00	0.00E+00	0.00E+00
Cumene[e]				
n-Hexane (see Hexane[e])				
Methylene chloride (Dichloromethane[e])	3.29E-08	0.00E+00	0.00E+00	0.00E+00
MTBE				
Styrene[e]	6.58E-07	0.00E+00	0.00E+00	0.00E+00
Tetrachloroethene (Tetrachloroethylene[e])	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,1,1-Trichloroethane (Methyl chloroform[e])	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Trichloroethene (Trichloroethylene[e])				
Trichlorofluoromethane				
m-/p-Xylene[e] (added into Xylene[e])	2.44E-05	0.00E+00	0.00E+00	0.00E+00
o-Xylene[e] (added into Xylene[e])	6.95E-06	0.00E+00	0.00E+00	0.00E+00
Phenol[e,f]				
Non-HAP Organic Compounds				
Methane	3.17E-03	0.00E+00	0.00E+00	0.00E+00

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

Facility: **Knife River Corporation -Mountain West**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

Load-out Operations AP-42 Section 11.1

Emissions Toggle =	1	
Max Hourly Production	250	T/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	Tons/yr

Pollutant	Emission Factor[a] Loadout (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	0.130	0.08	
PM-10 (total) [b]	5.22E-04	0.130	0.08	
PM-2.5 [b]	5.22E-04	0.130	0.08	
CO [b]	1.35E-03	0.337	0.20	
NOx				
SO_2				
VOC [d,g]	3.91E-03	0.977	0.59	
Lead				
HCl [d,e]	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-Hp-CDD				
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]	2.16E-06	5.41E-04	3.24E-04	**7.41E-05**
1,3-Butadiene[e]				
Ethylbenzene[e]	1.16E-05	2.91E-03	1.75E-03	1.46E-03
Formaldehyde[e]	3.66E-06	9.15E-04	5.49E-04	**1.25E-04**
Hexane[e]	6.24E-06	1.56E-03	9.36E-04	7.80E-04
Isooctane	7.49E-08	1.87E-05	1.12E-05	9.36E-06
Methyl Ethyl Ketone[e]	2.04E-06	5.09E-04	3.06E-04	2.55E-04
Pentane[e]				
Propionaldehyde[e]				
Quinone[e]				
Methyl chloroform[e]				
Toluene[e]	8.73E-06	2.18E-03	1.31E-03	1.09E-03
Xylene[e]	5.03E-05	1.26E-02	7.55E-03	6.29E-03
POM (7-PAH Group)		1.15E-04		**1.58E-05**

Pollutant	Emission Factor[a] Loadout (lb/ton)	Emissions (lb/hr) 1-hr Average	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PAH HAPs[f]				
2-Methylnaphthalene	8.11E-06	2.03E-03	1.22E-03	**2.78E-04**
3-Methylchloranthrene[e]				
Acenaphthene	8.86E-07	2.22E-04	1.33E-04	**3.04E-05**
Acenaphthylene	9.55E-08	2.39E-05	1.43E-05	**3.27E-06**
Anthracene	2.39E-07	5.97E-05	3.58E-05	**8.17E-06**
Benzo(a)anthracene	6.48E-08	1.62E-05	9.72E-06	**2.22E-06**
Benzo(a)pyrene[e]	7.84E-09	1.96E-06	1.18E-06	**2.69E-07**
Benzo(b)fluoranthene	2.59E-08	6.48E-06	3.89E-06	**8.87E-07**
Benzo(e)pyrene	2.66E-08	6.65E-06	3.99E-06	**9.11E-07**
Benzo(g,h,I)perylene	6.48E-09	1.62E-06	9.72E-07	**2.22E-07**
Benzo(k)fluoranthene	7.50E-09	1.88E-06	1.13E-06	**2.57E-07**
Chrysene	3.51E-07	8.78E-05	5.27E-05	**1.20E-05**
Dibenzo(a,h)anthracene	1.26E-09	3.15E-07	1.89E-07	**4.32E-08**
Dichlorobenzene			0.00E+00	
Fluoranthene	1.70E-07	4.26E-05	2.56E-05	**5.84E-06**
Fluorene	2.63E-06	6.56E-04	3.94E-04	**8.99E-05**
Indeno(1,2,3-cd)pyrene	1.60E-09	4.01E-07	2.40E-07	**5.49E-08**
Naphthalene[e]	4.26E-06	1.07E-03	6.39E-04	**1.46E-04**
Perylene	7.50E-08	1.88E-05	1.13E-05	**2.57E-06**
Phenanthrene	2.76E-06	6.90E-04	4.14E-04	**9.46E-05**
Pyrene	5.11E-07	1.28E-04	7.67E-05	**1.75E-05**
Non-HAP Organic Compounds				
Acetone[e]	1.95E-06	4.87E-04	2.92E-04	2.43E-04
Benzaldehyde				
Butane				
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene	2.95E-05	7.38E-03	4.43E-03	3.69E-03
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 $T\,(^{o}F) = 325$

Equation		LOADOUT	SILO FILL	
Total PM $EF = 0.000181+0.00141(-V)e^{((0.0251)(T+460)-20.43)}$ + $000332+ 0.00105(-V)e^{((0.0251)(T+460)-20.}$	=	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.

Facility: **Knife River Corporation -Mountain West**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

Load-out Operations AP-42 Section 11.1, Page 2

Fuel Type Toggle =	1	
Max Hourly Production	250	T/hr
Max Daily Production	3,000	Tons/day
Max Annual Production	300,000	Tons/yr

Pollutant	Emission Factor[a] Loadout (lb/ton)	Emissions (lb/hr) 1-hr Average	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
non-PAH HAPs[g]				
Bromomethane[e]	3.99E-07	9.98E-05	5.99E-05	4.99E-05
2-Butanone (see Methyl Ethyl Ketone)				
Carbon disulfide[e]	5.41E-07	1.35E-04	8.11E-05	6.76E-05
Chloroethane (Ethyl chloride[e])	8.73E-09	2.18E-06	1.31E-06	1.09E-06
Chloromethane (Methyl chloride[e])	6.24E-07	1.56E-04	9.36E-05	7.80E-05
Cumene[e]	4.57E-06	1.14E-03	6.86E-04	5.72E-04
n-Hexane (see Hexane[e])				
Methylene chloride (Dichloromethane[e])				
MTBE				
Styrene[e]	3.04E-07	7.59E-05	4.55E-05	3.80E-05
Tetrachloroethene (Tetrachloroethylene[e])	3.20E-07	8.01E-05	4.80E-05	4.00E-05
1,1,1-Trichloroethane (Methyl chloroform[e])				
Trichloroethene (Trichloroethylene[e])				
Trichlorofluoromethane	5.41E-08	1.35E-05	8.11E-06	6.76E-06
m-/p-Xylene[e] (added into Xylene[e])	1.71E-05	4.26E-03	2.56E-03	2.13E-03
o-Xylene[e] (added into Xylene[e])	3.33E-05	8.32E-03	4.99E-03	4.16E-03
Phenol[e,f]	4.02E-06	1.01E-03	6.03E-04	5.03E-04
Non-HAP Organic Compounds				
Methane	2.70E-04	6.76E-02	4.05E-02	3.38E-02

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

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	User Input Weight % Sulfur =	0.0015%
Fuel Consumption Rate	0.00 gal/hr	AP-42 1.3-1 EF is 0.142S lb SO2 per gallon of fuel oil	
Max Daily Operation	0 hr/day		
Max Annual Operation	0 hrs/yr		

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[c]	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[c]	7.60E-13	0.00E+00	0.00E+00	**0.00E+00**
Total HxCDD				
1,2,3,4,6,7,8-Hp-CDD[c]	1.50E-11	0.00E+00	0.00E+00	**0.00E+00**
Total HpCDD$_c$	2.00E-11	0.00E+00	0.00E+00	**0.00E+00**
Octa CDD[c]	1.60E-10	0.00E+00	0.00E+00	**0.00E+00**
Total PCDD[c]	2.00E-10	0.00E+00	0.00E+00	**0.00E+00**
Furans[e]				
2,3,7,8-TCDF				
Total TCDF[c]	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[c]	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[c]	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[c]	9.70E-12	0.00E+00	0.00E+00	**0.00E+00**
Octa CDF[c]	1.20E-11	0.00E+00	0.00E+00	**0.00E+00**
Total PCDF[c]	3.10E-11	0.00E+00	0.00E+00	**0.00E+00**
Total PCDD/PCDF[c]	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[c,e]	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,l)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[c,e]	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[f]				
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, SOx based on max fuel sulfur content, PM10 is 1.3 lb/1,000 gal + 50% of 2.0 lb/1,000 g
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**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

Asphalt Tank Heater - Natural Gas Fired, Estimated Emissions Using AP-42 Section 11.1 (Hot Mix Asphalt Plants)

Fuel Type Toggle =	1
Fuel Consumption Rate	0 scf/hr
Max Daily Operation	0 hr/day
Max Annual Operation	0 hrs/yr

Note: CO EF per AP-42 Table 1.4.1 for natural gas combustion in boilers is 84 lb/MMscf, a factor of 10 higher than the factor shown in Table 11.1-13
Tank heater CO emissions are based on using 84 lb/MMscf

Pollutant	Emission Factor[a] (lb/scf)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PM (total)				
PM-10 (total)				
PM-2.5				
CO [c]	**8.90E-06**	0.00E+00	0.00E+00	
NOx				
SO_2				
VOC				
Lead				
HCl [e]				
Dioxins[e]				
-- No EFs for Natural Gas Fuel --				
Furans[e]				
-- No EFs for Natural Gas Fuel --				
Non-PAH HAPs				
Acetaldehyde[e]				
Acrolein[e]				
Benzene[e]				
1,3-Butadiene[e]				
Ethylbenzene[e]				
Formaldehyde[c,e]	2.60E-08	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/scf)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PAH HAPs				
2-Methylnaphthalene				
3-Methylchloranthrene[e]				
Acenaphthene				
Acenaphthylene				
Anthracene				
Benzo(a)anthracene				
Benzo(a)pyrene[e]				
Benzo(b)fluoranthene				
Benzo(e)pyrene				
Benzo(g,h,I)perylene				
Benzo(k)fluoranthene				
Chrysene				
Dibenzo(a,h)anthracene				
Dichlorobenzene				
Fluoranthene				
Fluorene				
Indeno(1,2,3-cd)pyrene				
Naphthalene[e]				
Perylene				
Phenanthrene				
Pyrene				
Non-HAPs 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) (reserved)
c) AP-42, Table 11.1-13, Emission Factors for Hot Mix Asphalt Hot Oil Systems, 3/04
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.

Facility: **Knife River Corporation -Mountain West**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614**

Asphalt Tank Heater - Natural Gas Fired, Estimated Emissions Using AP-42 Section 1.4 (Natural Gas Combustion)

Fuel Type Toggle =	1	
Fuel Consumption Rate	0	scf/hr
Max Daily Operation	0	hr/day
Max Annual Operation	0	hrs/yr
Heating Value Correction:	1.000	applied to Emissions (lb/hr, T/yr) calculations

Note: CO EF per AP-42 Table 1.4.1 for natural gas combustion in boilers is 84 lb/MMscf, a factor of 10 higher than the factor shown in Table 11.1-13
Tank heater CO emissions are based on using 84 lb/MMscf

Pollutant	Emission Factor[a] (lb/MMscf)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PM (total)[c]	7.6	0.00E+00	0.00E+00	
PM-10 (total)[c]	7.6	0.00E+00	0.00E+00	
PM-2.5	7.6	0.00E+00	0.00E+00	
CO [b]	**84**	0.00E+00	0.00E+00	
NOx [b]	100	0.00E+00	0.00E+00	
SO_2 [c]	0.6	0.00E+00	0.00E+00	
VOC [c]	5.5	0.00E+00	0.00E+00	
Lead [c]	5.00E-04	0.00E+00	0.00E+00	
HCl [e]				
Dioxins[e]				
-- No EFs for Natural Gas Fuel --				
Furans[e]				
-- No EFs for Natural Gas Fuel --				
Non-PAH HAPs[f]				
Acetaldehyde[e]				
Acrolein[e]				
Benzene[c1, e]	2.10E-03	0.00E+00	0.00E+00	**0.00E+00**
1,3-Butadiene[e]				
Ethylbenzene[e]				
Formaldehyde[e]	7.50E-02	0.00E+00	0.00E+00	**0.00E+00**
Hexane[e]	1.80E+00	0.00E+00	0.00E+00	0.00E+00
Isooctane				
Methyl Ethyl Ketone[e]				
Pentane[c1, e]	2.60E+00	0.00E+00	0.00E+00	0.00E+00
Propionaldehyde[e]				
Quinone[e]				
Methyl chloroform[e]				
Toluene[c1, e]	3.40E-03	0.00E+00	0.00E+00	0.00E+00
Xylene[e]				
POM (7-PAH Group)		0.00E+00		**0.00E+00**

Pollutant	Emission Factor[a] (lb/MMscf)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PAH HAPs[f]				
2-Methylnaphthalene[c1]	2.40E-05	0.00E+00	0.00E+00	**0.00E+00**
3-Methylchloranthrene[c1, e]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Acenaphthene[c1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Acenaphthylene[c1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Anthracene[c1]	2.40E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(a)anthracene[c1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(a)pyrene[c1, e]	1.20E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(b)fluoranthenec[1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(e)pyrene				
Benzo(g,h,l)perylene[c1]	1.20E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(k)fluoranthene[c1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Chrysene[c1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Dibenzo(a,h)anthracene[c1]	1.20E-06	0.00E+00	0.00E+00	**0.00E+00**
Dichlorobenzene[c1]	1.20E-03	0.00E+00	0.00E+00	**0.00E+00**
Fluoranthene[c1]	3.00E-06	0.00E+00	0.00E+00	**0.00E+00**
Fluorene[c1]	2.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Indeno(1,2,3-cd)pyrene[c1]	1.80E-06	0.00E+00	0.00E+00	**0.00E+00**
Naphthalene[c1, e]	6.10E-04	0.00E+00	0.00E+00	**0.00E+00**
Perylene				
Phenanthrene[c1]	1.70E-05	0.00E+00	0.00E+00	**0.00E+00**
Pyrene[c1]	5.00E-06	0.00E+00	0.00E+00	**0.00E+00**
Non-HAPs Organic Compounds[f]				
Acetone[e]				
Benzaldehyde				
Butane[c1]	2.10E+00	0.00E+00	0.00E+00	0.00E+00
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene				
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				
Valeraldehyde				
Metals[g]				
Antimony[e]				
Arsenic[d,e]	2.00E-04	0.00E+00	0.00E+00	**0.00E+00**
Barium[d,e]	4.40E-03	0.00E+00	0.00E+00	0.00E+00
Beryllium[e]	1.20E-05	0.00E+00	0.00E+00	**0.00E+00**
Cadmium[d,e]	1.10E-03	0.00E+00	0.00E+00	**0.00E+00**
Chromium[d,e]	1.40E-03	0.00E+00	0.00E+00	0.00E+00
Cobalt[d,e]	8.40E-05	0.00E+00	0.00E+00	0.00E+00
Copper[d,e]	8.50E-04	0.00E+00	0.00E+00	0.00E+00
Hexavalent Chromium[e]				
Manganese[d,e]				
Mercury[d,e]				
Molybdenum[d,e]	1.10E-03	0.00E+00	0.00E+00	0.00E+00
Nickel[d,e]				
Phosphorus[e]				
Silver[e]				
Selenium[d,e]				
Thallium[e]				
Vanadium[d,e]	2.30E-03	0.00E+00	0.00E+00	0.00E+00
Zinc[d,e]				

a) Emission factors are from AP-42
b) AP-42, Table 1.4-1, Emission Factors for NOx and CO from Natural Gas Combustion, 7/98
c) AP-42, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion, 7/98
c1) AP-42, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion, 7/98
d) AP-42, Table 1.4-4, Emission Factors for Metals from Natural Gas Combustion, 7/98
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**
7/27/2020 18:59 **Permit/Facility ID:** **P-2018.0042** **777-00614**

Asphalt Tank Heater - LPG Fired, Estimated Emissions Using AP-42 Section 1

Fuel Type Toggle = 1

Pollutant	Emission Factor(lb/MMscf)	Emissions[a] (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PM (total)		0.00E+00	0.00E+00	
PM-10 (total)		0.00E+00	0.00E+00	
PM-2.5		0.00E+00	0.00E+00	
CO		0.00E+00	0.00E+00	
NOx		0.00E+00	0.00E+00	
SO_2 [b]		0.00E+00	0.00E+00	
VOC		0.00E+00	0.00E+00	
Lead				
HCl				
Dioxins[e]				
-- No EFs for Natural Gas Fuel --				
Furans[e]				
-- No EFs for Natural Gas Fuel --				

Non-PAH HAPs[f]					
Acetaldehyde[e]					
Acrolein[e]					
Benzene[c1, e]					
1,3-Butadiene[e]					
Ethylbenzene[e]					
Formaldehyde[e]					
Hexane[e]					
Isooctane					
Methyl Ethyl Ketone[e]					
Pentane[c1, e]					
Propionaldehyde[e]					
Quinone[e]					
Methyl chloroform[e]					
Toluene[c1, e]					
Xylene[e]					
POM (7-PAH Group)					

a) Emissions are from AP-42 Section 1.5
Table 1.5-1, footnote a) states PM, CO and TOC emissions are the same, on a heat input basis
as for natural gas. This footnote also states NOx emission from propane combustion
are approxately 1.5 times that of natural gas combustion on a heat input input basis (when calculate t
AP-42 Section 1.5 does not have emissions factors for toxic air pollutants or lead.
b) DEQ presumes for small tank heaters SO_2 emisisons from naural gas combustion and propance c

.5 (LPG Combustion)

Pollutant	Emission Factor[a] (lb/MMscf)	Emissions (lb/hr)	Emissions (T/yr)	TAPs Emissions (lb/hr) **Annual** or 24-hr Average
PAH HAPs[f]				
2-Methylnaphthalene[c1]				
3-Methylchloranthrene [c1, e]				
Acenaphthene[c1]				
Acenaphthylene[c1]				
Anthracene[c1]				
Benzo(a)anthracene[c1]				
Benzo(a)pyrene[c1, e]				
Benzo(b)fluoranthenec[1]				
Benzo(e)pyrene				
Benzo(g,h,I)perylene[c1]				
Benzo(k)fluoranthene[c1]				
Chrysene[c1]				
Dibenzo(a,h)anthracene[c1]				
Dichlorobenzene[c1]				
Fluoranthene[c1]				
Fluorene[c1]				
Indeno(1,2,3-cd)pyrene[c1]				
Naphthalene[c1, e]				
Perylene				
Phenanthrene[c1]				
Pyrene[c1]				
Non-HAPs Organic Compounds[f]				
Acetone[e]				
Benzaldehyde				
Butane[c1]				
Butyraldehyde				
Crotonaldehyde[e]				
Ethylene				
Heptane				
Hexanal				
Isovaleraldehyde				
2-Methyl-1-pentene				
2-Methyl-2-butene				
3-Methylpentane				
1-Pentene				
n-Pentane				

Valeraldehyde				
Metals[g]				
Antimony[e]				
Arsenic[d,e]				
Barium[d,e]				
Beryllium[e]				
Cadmium[d,e]				
Chromium[d,e]				
Cobalt[d,e]				
Copper[d,e]				
Hexavalent Chromium[e]				
Manganese[d,e]				
Mercury[d,e]				
Molybdenum[d,e]				
Nickel[d,e]				
Phosphorus[e]				
Silver[e]				
Selenium[d,e]				
Thallium[e]				
Vanadium[d,e]				
Zinc[d,e]				

the actual factor is 1.45).

combustion are the same.

Facility: **Knife River Corporation -Mountain West**
7/27/2020 18:59 **Permit P-2018.0042** **Facility ID: 777-00614**

G1 Electrical Generator < 600 hp (447 kW)

Fuel Type Toggle =	1	
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):	**0**
Not EPA Certified:	Yes
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

g/kW-hr x (lb/453g) x (hp-hr/7000 Btu) x (0.746 kW/hp) x 10^6 Btu/MMBtu = lb/MMBtu
g/kW-hr x 0.23486 = lb/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*

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 engine out put converted to lb/MMBtu fuel input)

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 ≤ 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

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

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: Knife River Corporation -Mountain West

7/27/2020 18:59 **Permit/Facility ID:** P-2018.0042 777-00614

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

Fuel Type Toggle =	1	0 kw	User Input Weight % Sulfur = 0.0015%
Fuel Consumption Rate	0.00 gal/hr		AP-42 3.3 SO2 EF = 0.29 for #2 fuel oil, presumed max 0.5%
Calculated MMBtu/hr	0.000 MMBtu/hr		SO2 emissions are multiplied by a factor: User Input Value/0.5% = 0.00
Max Daily Operation	0 hr/day		Not an EPA-Certified Generator
Max Annual Operation	0 hrs/yr		

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	0.31	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 [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[c]				
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD[c]				
Total HxCDD				
1,2,3,4,6,7,8-Hp-CDD[c]				
Total HpCDD[c]				
Octa CDD[c]				
Total PCDD[c]				
Furans[e]				
2,3,7,8-TCDF				
Total TCDF[c]				
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF[c]				
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[c]				
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF[c]				
Octa CDF[c]				
Total PCDF[c]				
Total PCDD/PCDF[c]				
Non-PAH HAPs				
Acetaldehyde[c]	7.67E-04	0.00E+00	0.00E+00	**0.00E+00**
Acrolein[c]	9.25E-05	0.00E+00	0.00E+00	0.00E+00
Benzene[c,e]	9.33E-04	0.00E+00	0.00E+00	**0.00E+00**
1,3-Butadiene[c,e]	3.91E-05	0.00E+00	0.00E+00	**0.00E+00**
Ethylbenzene[e]				
Formaldehyde[c,e]	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[c,e]	4.09E-04	0.00E+00	0.00E+00	0.00E+00
Xylene[c,e]	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[c]	1.42E-06	0.00E+00	0.00E+00	**0.00E+00**
Acenaphthylene[c]	5.06E-06	0.00E+00	0.00E+00	**0.00E+00**
Anthracene[c]	1.87E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(a)anthracene[c]	1.68E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(a)pyrene[c,e]	1.88E-07	0.00E+00	0.00E+00	**0.00E+00**
Benzo(b)fluoranthene[c]	9.91E-08	0.00E+00	0.00E+00	**0.00E+00**
Benzo(e)pyrene				
Benzo(g,h,l)perylene[c]	4.89E-07	0.00E+00	0.00E+00	**0.00E+00**
Benzo(k)fluoranthene[c]	1.55E-07	0.00E+00	0.00E+00	**0.00E+00**
Chrysene[c]	3.53E-07	0.00E+00	0.00E+00	**0.00E+00**
Dibenzo(a,h)anthracene[c]	5.83E-07	0.00E+00	0.00E+00	**0.00E+00**
Dichlorobenzene				
Fluoranthene[c]	7.61E-06	0.00E+00	0.00E+00	**0.00E+00**
Fluorene[c]	2.92E-05	0.00E+00	0.00E+00	**0.00E+00**
Indeno(1,2,3-cd)pyrene[c]	3.75E-07	0.00E+00	0.00E+00	**0.00E+00**
Naphthalene[c,e]	8.48E-05	0.00E+00	0.00E+00	**0.00E+00**
Perylene				
Phenanthrene[c]	2.94E-05	0.00E+00	0.00E+00	**0.00E+00**
Pyrene[c]	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 or 40 CFR 89 applicable standard, whichever applies

c) AP-42, Table 3.3-2, Speciated Organic Compoun 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.

Facility: **Knife River Corporation -Mountain** **Facility ID: 777-00614**

7/27/2020 18:59 **Permit P-2018.0042** **ERROR - GENERATOR RATING IS LESS THAN 447 kW**

G2 Electrical Generator > 600 hp (447 kW)

Fuel Type Toggle =	1	
Fuel Consumption Rate	0.00	gal/hr
Calculated MMBtu/hr	0.00	MMBtu/hr
Max Daily Operation	0	hr/day
Max Annual Operation	0	hrs/yr

Rated Power (kW):	**0**
Not EPA Certified:	Yes
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

g/kW-hr x (lb/453g) x (hp-hr/7000 Btu) x (0.746 kW/hp) x 10^6 Btu/MMBtu = lb/MMBtu

g/kW-hr x 0.23486 = lb/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's*

Pollutant:	**NOx**	**VOC (total TOC--> VOCs)**		**CO**	**PM=PM10**
EMISSION FACTORS USED FOR G2 (lb/MMBtu):	**3.20**	**0.09**		**0.85**	**0.130**

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 engine out put converted to lb/MMBtu fuel input)

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	0	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 G1 (lb/MMBtu fuel input)

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	0	2014	0.00	0.00	0.00	0.00	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):				**0.00**	**0.00**	**0.00**	**0.00**	**0.000**

Facility: **Knife River Corporation -Mountain West**
7/27/2020 18:59 **Permit/Facility ID: P-2018.0042 777-00614** **ERROR - IC ENGINE 2 RATING IS LESS THAN 600 bhp**

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

Fuel Type Toggle =	1	0 kw	User Input Weight % Sulfur =	0.0015%
Fuel Consumption Rate	0.00 gal/hr		AP-42 3.4-1 SO2 EF = 1.01 x S	
Calculated MMBtu/hr	0.00 MMBtu/hr			
Max Daily Operation	0 hr/day		Not an EPA-Certified Generator	
Max Annual Operation	0 hrs/yr			

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	0.000	0.00E+00	0.00E+00
PM-10 (total) [d]	0.13	0.000	0.00E+00	0.00E+00
PM-2.5	0.13	0.000	0.00E+00	0.00E+00
CO [b]	0.85	0.000	0.00E+00	
NOx[b]	3.20	0.000	0.00E+00	0.00E+00
SO_2 [b] (total SOx presumed SO2)	0.001515	0.000	0.000	0.00E+00
VOC [b] (total TOC--> VOCs)	0.09	0.000	0.000	
Lead				
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[c]				
1,2,3,6,7,8-HxCDD				
1,2,3,7,8,9-HxCDD[c]				
Total HxCDD				
1,2,3,4,6,7,8-Hp-CDD[c]				
Total HpCDD[c]				
Octa CDD[c]				
Total PCDD[c]				
Furans[e]				
2,3,7,8-TCDF				
Total TCDF[c]				
1,2,3,7,8-PeCDF				
2,3,4,7,8-PeCDF				
Total PeCDF[c]				
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[c]				
1,2,3,4,6,7,8-HpCDF				
1,2,3,4,7,8,9-HpCDF				
Total HpCDF[c]				
Octa CDF[c]				
Total PCDF[c]				
Total PCDD/PCDF[c]				
Non-PAH HAPs				
Acetaldehyde[c]	2.52E-05	0.00E+00	0.00E+00	**0.00E+00**
Acrolein[c]	7.88E-06	0.00E+00	0.00E+00	0.00E+00
Benzene[c,e]	7.76E-04	0.00E+00	0.00E+00	**0.00E+00**
1,3-Butadiene[c,e]				
Ethylbenzene[e]				
Formaldehyde[c,e]	7.89E-05	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[c,e]	2.81E-04	0.00E+00	0.00E+00	0.00E+00
Xylene[c,e]	1.93E-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
PAH HAPs				
2-Methylnaphthalene				
3-Methylchloranthrene[e]				
Acenaphthene[c1]	4.68E-06	0.00E+00	0.00E+00	**0.00E+00**
Acenaphthylene[c1]	9.23E-06	0.00E+00	0.00E+00	**0.00E+00**
Anthracene[c1]	1.23E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(a)anthracene[c1]	6.22E-07	0.00E+00	0.00E+00	**0.00E+00**
Benzo(a)pyrene[c1,e]	2.57E-07	0.00E+00	0.00E+00	**0.00E+00**
Benzo(b)fluoranthene[c1]	1.11E-06	0.00E+00	0.00E+00	**0.00E+00**
Benzo(e)pyrene				
Benzo(g,h,l)perylene[c1]	5.56E-07	0.00E+00	0.00E+00	**0.00E+00**
Benzo(k)fluoranthene[c1]	2.18E-07	0.00E+00	0.00E+00	**0.00E+00**
Chrysene[c1]	1.53E-06	0.00E+00	0.00E+00	**0.00E+00**
Dibenzo(a,h)anthracene[c1]	3.46E-07	0.00E+00	0.00E+00	**0.00E+00**
Dichlorobenzene				
Fluoranthene[c1]	4.03E-06	0.00E+00	0.00E+00	**0.00E+00**
Fluorene[c1]	1.28E-05	0.00E+00	0.00E+00	**0.00E+00**
Indeno(1,2,3-cd)pyrene[c1]	4.14E-07	0.00E+00	0.00E+00	**0.00E+00**
Naphthalene[c1,e]	1.30E-04	0.00E+00	0.00E+00	**0.00E+00**
Perylene				
Phenanthrene[c1]	4.08E-05	0.00E+00	0.00E+00	**0.00E+00**
Pyrene[c1]	3.71E-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 3.4-1, 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
c) 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 or 40 CFR 89 applicable standard, whichever applies
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**
7/27/2020 18:59 **Permit/Facility ID:** **P-2018.0042** **777-00614**

Max Hourly Production	250	T/hr	96%	T/hr is Aggregate & RAP =	**240 T/hr**
Max Daily Production	3,000	Tons/day	96%	T/day is Aggregate & RAP =	**2,880 T/day**
Max Annual Production	300,000	Tons/yr	96%	T/yr is Aggregate & RAP =	**288,000 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 stabiliizes between 3 and 5% by weight.

Windspeed Variation Factors for AERMOD modeling:				PM10		PM2.5	
Wind Category	Upper windspeed (m/sec)	Avg windspeed (m/sec)	Avg windspeed (mph)	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: **240 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	0.79	0.40	0.48	0.11	1.59	0.79	0.95	0.22
PM-10 (total)	1.56E-03	0.38	0.19	0.23	0.05	0.75	0.38	0.45	0.10
PM-2.5	2.37E-04	0.06	0.03	0.03	0.01	0.11	0.06	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: **240 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	7.93E-02	3.97E-02	4.76E-02	1.09E-02	1.59E-01	7.93E-02	9.52E-02	2.17E-02
PM-10 (total)	1.56E-03	3.75E-02	1.88E-02	2.25E-02	5.14E-03	7.50E-02	3.75E-02	4.50E-02	1.03E-02
PM-2.5	2.37E-04	5.68E-03	2.84E-03	3.41E-03	7.78E-04	1.14E-02	5.68E-03	6.82E-03	1.56E-03

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

Aggregate flow across scalping screen onto conveyor: **240 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	0.600	3.00E-01	3.60E-01	8.22E-02
PM-10 (total)	0.0087	0.209	1.04E-01	1.25E-01	2.86E-02
PM-2.5	1.30E-04	0.003	1.56E-03	1.87E-03	4.27E-04

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

Aggregate transfer from conveyor to drum dryer (1 transfer point): **240 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	7.93E-02	3.97E-02	4.76E-02	1.09E-02
PM-10 (total)	1.56E-03	3.75E-02	1.88E-02	2.25E-02	5.14E-03
PM-2.5	2.37E-04	5.68E-03	2.84E-03	3.41E-03	7.78E-04

Facility: Knife River Corporation -Mountain West
7/27/2020 18:59 Permit/Facility ID: P-2018.0042 777-00614

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) = 1
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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	4,950.00	1.00	4,950.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.80	21.00	37.80
N_2O	0.26	lb/10^3 gal	AP-42 Table 1.3-8	0.085383	310.00	26.47

Tank Heater	Emission Factor (EF)	EF Units	EF Source	T/yr	Global Warming Potential	CO_2e T/yr
CO_2	Assumes all carbon is converted to CO_2			0.00	1	0.00
Methane	0.216	lb/10^3 gal	AP-42 Table 1.3-3	0.00E+00	21	0.00
N_2O	0.26	lb/10^3 gal	AP-42 Table 1.3-8	0.00E+00	310	0.00

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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	4,950.00	1.00	4,950.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.80	21.00	37.80
N_2O	0.53	lb/10^3 gal	AP-42 Table 1.3-8	0.174049	310.00	53.96

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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	4,950.00	1.00	4,950.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.80	21.00	37.80
N_2O	0.26	lb/10^3 gal	AP-42 Table 1.3-8	0.085383	310.00	26.47

Tank Heater	Emission Factor (EF)	EF Units	EF Source	T/yr	Global Warming Potential	CO_2e 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_2O	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_2e (T/yr)
CO_2	33.00	lb/T	AP-42 Table 11.1-7	4,950.00	1.00	4,950.00
Methane	0.012	lb/T	AP-42 Table 11.1-8	1.80	21.00	37.80
N_2O	0.26	lb/10^3 gal	AP-42 Table 1.3-8	0.085383	310.00	26.47

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_2e (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_2e (T/yr)
CO_2	1.16	lb/bhp-hr	AP-42 Table 3.4-1	0.00	1.00	0.00

Total Green House Gas Emissions

Total Emissions	CO_2e (T/yr)
CO_2	4,950.00
Methane	37.80
N_2O	53.96
Grand Total	**5,041.76**

Facility:	**Knife River Corporation -Mountain West**			**EMISSION INVENTORY**
7/27/2020 18:59	**Permit/Facility ID:**	**P-2018.0042**	**777-00614**	**POUNDS PER HOUR** Page 1 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: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year **3,000** Tons/day
Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane
B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** 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: **0.00** gal/hour **0** Hours/year IC Engine > 600hp #2 Fuel Oil **0** 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)
PM (total)	8.25	0.00E+00	0.00E+00	1.30E-01	8.38
PM-10 (total)	5.75	0.00E+00	0.00E+00	1.30E-01	5.88
PM-2.5	5.58	0.00E+00	0.00E+00	1.30E-01	5.71
CO	32.50	0.00E+00	0.00E+00	3.37E-01	32.84
NOx	13.75	0.00E+00	0.00E+00		13.75
SO_2	4.45	0.00E+00	0.00E+00		4.45
VOC	8.00	0.00E+00	0.00E+00	9.77E-01	8.98
Lead	3.75E-03	0.00E+00	0.00E+00		3.75E-03
HCl [e]	5.25E-02	0.00E+00	0.00E+00		5.25E-02
Dioxins[e]					
2,3,7,8-TCDD	7.19E-12				**7.19E-12**
Total TCDD	3.18E-11				**3.18E-11**
1,2,3,7,8-PeCDD	1.06E-11				**1.06E-11**
Total PeCDD	7.53E-10				**7.53E-10**
1,2,3,4,7,8-HxCDD	1.44E-11	0.00E+00			**1.44E-11**
1,2,3,6,7,8-HxCDD	4.45E-11				**4.45E-11**
1,2,3,7,8,9-HxCDD	3.36E-11	0.00E+00			**3.36E-11**
Total HxCDD	4.11E-10				**4.11E-10**
1,2,3,4,6,7,8-Hp-CDD	1.64E-10	0.00E+00			**1.64E-10**
Total HpCDD	6.51E-10	0.00E+00			**6.51E-10**
Octa CDD	8.56E-10	0.00E+00			**8.56E-10**
Total PCDD[h]	2.71E-09	0.00E+00			**2.71E-09**
Furans[e]					
2,3,7,8-TCDF	3.32E-11				**3.32E-11**
Total TCDF	1.27E-10	0.00E+00			**1.27E-10**
1,2,3,7,8-PeCDF	1.47E-10				**1.47E-10**
2,3,4,7,8-PeCDF	2.88E-11				**2.88E-11**
Total PeCDF	2.88E-09	0.00E+00			**2.88E-09**
1,2,3,4,7,8-HxCDF	1.37E-10				**1.37E-10**
1,2,3,6,7,8-HxCDF	4.11E-11				**4.11E-11**
2,3,4,6,7,8-HxCDF	6.51E-11				**6.51E-11**
1,2,3,7,8,9-HxCDF	2.88E-10				**2.88E-10**
Total HxCDF	4.45E-10	0.00E+00			**4.45E-10**
1,2,3,4,6,7,8-HpCDF	2.23E-10				**2.23E-10**
1,2,3,4,7,8,9-HpCDF	9.25E-11				**9.25E-11**
Total HpCDF	3.42E-10	0.00E+00			**3.42E-10**
Octa CDF	1.64E-10	0.00E+00			**1.64E-10**
Total PCDF[h]	1.37E-09	0.00E+00			**1.37E-09**
Total PCDD/PCDF[h]	4.11E-09	0.00E+00	0.00E+00		**4.11E-09**
Non-PAH HAPs					
Acetaldehyde[e]	4.45E-02		0.00E+00		**4.45E-02**
Acrolein[e]	3.25E-03		0.00E+00		3.25E-03
Benzene[e]	1.34E-02	0.00E+00	0.00E+00	7.41E-05	**1.34E-02**
1,3-Butadiene[e]			0.00E+00		**0.00E+00**
Ethylbenzene[e]	3.00E-02			1.46E-03	3.15E-02
Formaldehyde[e]	1.06E-01	0.00E+00	0.00E+00	1.25E-04	**1.06E-01**
Hexane[e]	1.15E-01	0.00E+00		7.80E-04	1.16E-01
Isooctane	5.00E-03			9.36E-06	5.01E-03
Methyl Ethyl Ketone[e]	2.50E-03			2.55E-04	2.75E-03
Pentane[e]		0.00E+00			0.00E+00
Propionaldehyde[e]	1.63E-02				1.63E-02
Quinone[e]	2.00E-02				2.00E-02
Methyl chloroform[e]	6.00E-03				6.00E-03
Toluene[e]	3.63E-01	0.00E+00	0.00E+00	1.09E-03	3.64E-01
Xylene[e]	2.50E-02		0.00E+00	6.29E-03	3.13E-02
POM (7-PAH Group)[e]	1.88E-05	0.00E+00	0.00E+00	1.58E-05	**3.45E-05**
TOTAL PAH HAPs	3.03E-02	0.00E+00	0.00E+00	6.93E-04	**3.10E-02**

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 IC1 + IC2** 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)
PAH HAPs					
2-Methylnaphthalene	5.82E-03	0.00E+00		2.78E-04	**6.10E-03**
3-Methylchloranthrene[e]	0.00E+00	0.00E+00			**0.00E+00**
Acenaphthene	4.79E-05	0.00E+00	0.00E+00	3.04E-05	**7.83E-05**
Acenaphthylene	7.53E-04	0.00E+00	0.00E+00	3.27E-06	**7.57E-04**
Anthracene	1.06E-04	0.00E+00	0.00E+00	8.17E-06	**1.14E-04**
Benzo(a)anthracene[e]	7.19E-06	0.00E+00	0.00E+00	2.22E-06	**9.41E-06**
Benzo(a)pyrene[e]	3.36E-07	0.00E+00	0.00E+00	2.69E-07	**6.04E-07**
Benzo(b)fluoranthene[e]	3.42E-06	0.00E+00	0.00E+00	8.87E-07	**4.31E-06**
Benzo(e)pyrene	3.77E-06	0.00E+00		9.11E-07	**4.68E-06**
Benzo(g,h,i)perylene	1.37E-06	0.00E+00	0.00E+00	2.22E-07	**1.59E-06**
Benzo(k)fluoranthene[e]	1.40E-06	0.00E+00	0.00E+00	2.57E-07	**1.66E-06**
Chrysene[e]	6.16E-06	0.00E+00	0.00E+00	1.20E-05	**1.82E-05**
Dibenzo(a,h)anthracene[e]	0.00E+00	0.00E+00	0.00E+00	4.32E-08	**4.32E-08**
Dichlorobenzene	0.00E+00	0.00E+00			**0.00E+00**
Fluoranthene	2.09E-05	0.00E+00	0.00E+00	5.84E-06	**2.67E-05**
Fluorene	3.77E-04	0.00E+00	0.00E+00	8.99E-05	**4.67E-04**
Indeno(1,2,3-cd)pyrene[e]	2.40E-07	0.00E+00	0.00E+00	5.49E-08	**2.95E-07**
Naphthalene[e]	2.23E-02	0.00E+00	0.00E+00	1.46E-04	**2.24E-02**
Perylene	3.01E-07	0.00E+00		2.57E-06	**2.87E-06**
Phenanthrene	7.88E-04	0.00E+00	0.00E+00	9.46E-05	**8.82E-04**
Pyrene	1.03E-04	0.00E+00	0.00E+00	1.75E-05	**1.20E-04**
Non-HAP Organic Compounds					
Acetone[e]	1.04E-01	0.00E+00		1.08E-03	1.05E-01
Benzaldehyde	1.38E-02	0.00E+00			1.38E-02
Butane	8.38E-02	0.00E+00			8.38E-02
Butyraldehyde	2.00E-02	0.00E+00			2.00E-02
Crotonaldehyde[e]	1.08E-02	0.00E+00			1.08E-02
Ethylene	8.75E-01	0.00E+00		2.04E-02	8.95E-01
Heptane	1.18E+00	0.00E+00			1.18E+00
Hexanal	1.38E-02	0.00E+00			1.38E-02
Isovaleraldehyde	4.00E-03	0.00E+00			4.00E-03
2-Methyl-1-pentene	5.00E-01	0.00E+00			5.00E-01
2-Methyl-2-butene	7.25E-02	0.00E+00			7.25E-02
3-Methylpentane	2.38E-02	0.00E+00			2.38E-02
1-Pentene	2.75E-01	0.00E+00			2.75E-01
n-Pentane	2.63E-02	0.00E+00			2.63E-02
Valeraldehyde[e]	8.38E-03	0.00E+00			8.38E-03
Metals					
Antimony[e]	2.25E-05	0.00E+00			2.25E-05
Arsenic[e]	1.92E-05	0.00E+00			**1.92E-05**
Barium[e]	7.25E-04	0.00E+00			7.25E-04
Beryllium[e]	0.00E+00	0.00E+00			**0.00E+00**
Cadmium[e]	1.40E-05	0.00E+00			**1.40E-05**
Chromium[e]	6.88E-04	0.00E+00			6.88E-04
Cobalt[e]	3.25E-06	0.00E+00			3.25E-06
Copper[e]	3.88E-04	0.00E+00			3.88E-04
Hexavalent Chromium[e]	1.54E-05	0.00E+00			**1.54E-05**
Manganese[e]	9.63E-04	0.00E+00			9.63E-04
Mercury[e]	3.25E-04	0.00E+00			3.25E-04
Molybdenum[e]	0.00E+00	0.00E+00			0.00E+00
Nickel[e]	2.16E-03	0.00E+00			**2.16E-03**
Phosphorus[e]	3.50E-03	0.00E+00			3.50E-03
Silver[e]	6.00E-05	0.00E+00			6.00E-05
Selenium[e]	4.38E-05	0.00E+00			4.38E-05
Thallium[e]	5.13E-07	0.00E+00			5.13E-07
Vanadium[e]	0.00E+00	0.00E+00			0.00E+00
Zinc[e]	7.63E-03	0.00E+00			7.63E-03

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

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

A. Drum Mix Plant: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year HMA throughput **3,000** hrs/day
Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane
B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** 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: **0.00** gal/hour **0** Hours/year #2 Fuel Oil Generator > 600hp **0** 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[g]					
Bromomethane[e]				4.99E-05	4.99E-05
2-Butanone (see Methyl Ethyl Ketone)					
Carbon disulfide[e]				6.76E-05	6.76E-05
Chloroethane (Ethyl chloride[e])				1.09E-06	1.09E-06
Chloromethane (Methyl chloride[e])				7.80E-05	7.80E-05
Cumene				5.72E-04	5.72E-04
n-Hexane					
Methylene chloride (Dichloromethane[e])				0.00E+00	0.00E+00
MTBE					
Styrene[e]				3.80E-05	3.80E-05
Tetrachloroethene (Tetrachloroethylene[e])				4.00E-05	4.00E-05
1,1,1-Trichloroethane (Methyl chloroform[e])					
Trichloroethene (Trichloroethylene[e])					
Trichlorofluoromethane				6.76E-06	6.76E-06
m-/p-Xylene[e]				2.13E-03	2.13E-03
o-Xylene[e]				4.16E-03	4.16E-03
Phenol[e,f]				5.03E-04	5.03E-04
Non-HAP Organic Compounds					
Methane				3.38E-02	3.38E-02

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

7/27/2020 18:59 **Permit/Facility ID:** P-2018.0042 777-00614

EMISSION INVENTORY

TONS PER YEAR

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

A. Drum Mix Plant: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year HMA throughput **3,000** hrs/day

Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane

B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** 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: **0.00** gal/hour **0** Hours/year IC Engine > 600hp #2 Fuel Oil **0** 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)	4.95	0.00E+00	0.00E+00	7.83E-02	4.95
PM-10 (total)	3.45	0.00E+00	0.00E+00	7.83E-02	3.45
PM-2.5	3.35	0.00E+00	0.00E+00	7.83E-02	3.35
CO	19.50	0.00E+00	0.00E+00	2.02E-01	19.50
NOx	8.25	0.00E+00	0.00E+00		8.25
SO_2	2.67	0.00E+00	0.00E+00		2.67
VOC	4.80	0.00E+00	0.00E+00	5.86E-01	4.80
Lead	2.25E-03	0.00E+00	0.00E+00		2.25E-03
HCl [e]	3.15E-02	0.00E+00	0.00E+00		3.15E-02
Dioxins[e]					
2,3,7,8-TCDD	3.15E-11				3.15E-11
Total TCDD	1.40E-10				1.40E-10
1,2,3,7,8-PeCDD	4.65E-11				4.65E-11
Total PeCDD	3.30E-09				3.30E-09
1,2,3,4,7,8-HxCDD	6.30E-11	0.00E+00			6.30E-11
1,2,3,6,7,8-HxCDD	1.95E-10				1.95E-10
1,2,3,7,8,9-HxCDD	1.47E-10	0.00E+00			1.47E-10
Total HxCDD	1.80E-09				1.80E-09
1,2,3,4,6,7,8-Hp-CDD	7.20E-10	0.00E+00			7.20E-10
Total HpCDD	2.85E-09	0.00E+00			2.85E-09
Octa CDD	3.75E-09	0.00E+00			3.75E-09
Total PCDD[h]	1.19E-08	0.00E+00			1.19E-08
Furans[e]					
2,3,7,8-TCDF	1.46E-10				1.46E-10
Total TCDF	5.55E-10	0.00E+00			5.55E-10
1,2,3,7,8-PeCDF	6.45E-10				6.45E-10
2,3,4,7,8-PeCDF	1.26E-10				1.26E-10
Total PeCDF	1.26E-08	0.00E+00			1.26E-08
1,2,3,4,7,8-HxCDF	6.00E-10				6.00E-10
1,2,3,6,7,8-HxCDF	1.80E-10				1.80E-10
2,3,4,6,7,8-HxCDF	2.85E-10				2.85E-10
1,2,3,7,8,9-HxCDF	1.26E-09				1.26E-09
Total HxCDF	1.95E-09	0.00E+00			1.95E-09
1,2,3,4,6,7,8-HpCDF	9.75E-10				9.75E-10
1,2,3,4,7,8,9-HpCDF	4.05E-10				4.05E-10
Total HpCDF	1.50E-09	0.00E+00			1.50E-09
Octa CDF	7.20E-10	0.00E+00			7.20E-10
Total PCDF[h]	6.00E-09	0.00E+00			6.00E-09
Total PCDD/PCDF[h]	1.80E-08	0.00E+00			1.80E-08
Non-PAH HAPs					
Acetaldehyde[e]	1.95E-01		0.00E+00		1.95E-01
Acrolein[e]	3.90E-03		0.00E+00		3.90E-03
Benzene[e]	5.85E-02	0.00E+00	0.00E+00	3.24E-04	5.85E-02
1,3-Butadiene[e]	0.00E+00		0.00E+00		0.00E+00
Ethylbenzene[e]	3.60E-02			1.75E-03	3.60E-02
Formaldehyde[e]	4.65E-01	0.00E+00	0.00E+00	5.49E-04	4.65E-01
Hexane[e]	1.38E-01	0.00E+00		9.36E-04	1.38E-01
Isooctane	6.00E-03			1.12E-05	6.00E-03
Methyl Ethyl Ketone[e]	3.00E-03			3.06E-04	3.00E-03
Pentane[e]	0.00E+00	0.00E+00			0.00E+00
Propionaldehyde[e]	1.95E-02				1.95E-02
Quinone[e]	2.40E-02				2.40E-02
Methyl chloroform[e]	7.20E-03				7.20E-03
Toluene[e]	4.35E-01	0.00E+00	0.00E+00	1.31E-03	4.35E-01
Xylene[e]	3.00E-02	0.00E+00	0.00E+00	7.55E-03	3.00E-02
TOTAL Federal HAPs (T/yr)=					**1.61E+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	2.55E-02	0.00E+00		1.22E-03	2.55E-02
3-Methylchloranthrene[e]	0.00E+00	0.00E+00			0.00E+00
Acenaphthene	2.10E-04	0.00E+00	0.00E+00	1.33E-04	2.10E-04
Acenaphthylene	3.30E-03	0.00E+00	0.00E+00	1.43E-05	3.30E-03
Anthracene	4.65E-04	0.00E+00	0.00E+00	3.58E-05	4.65E-04
Benzo(a)anthracene[e]	3.15E-05	0.00E+00	0.00E+00	9.72E-06	3.15E-05
Benzo(a)pyrene[e]	1.47E-06	0.00E+00	0.00E+00	1.18E-06	1.47E-06
Benzo(b)fluoranthene[e]	1.50E-05	0.00E+00	0.00E+00	3.89E-06	1.50E-05
Benzo(e)pyrene	1.65E-05	0.00E+00		3.99E-06	1.65E-05
Benzo(g,h,l)perylene	6.00E-06	0.00E+00	0.00E+00	9.72E-07	6.00E-06
Benzo(k)fluoranthene[e]	6.15E-06	0.00E+00	0.00E+00	1.13E-06	6.15E-06
Chrysene[e]	2.70E-05	0.00E+00	0.00E+00	5.27E-05	2.70E-05
Dibenzo(a,h)anthracene[e]	0.00E+00	0.00E+00	0.00E+00	1.89E-07	0.00E+00
Dichlorobenzene	0.00E+00	0.00E+00			0.00E+00
Fluoranthene	9.15E-05	0.00E+00	0.00E+00	2.56E-05	9.15E-05
Fluorene	1.65E-03	0.00E+00	0.00E+00	3.94E-04	1.65E-03
Indeno(1,2,3-cd)pyrene[e]	1.05E-06	0.00E+00	0.00E+00	2.40E-07	1.05E-06
Naphthalene[e]	9.75E-02	0.00E+00	0.00E+00	6.39E-04	9.75E-02
Perylene	1.32E-06	0.00E+00		1.13E-05	1.32E-06
Phenanthrene	3.45E-03	0.00E+00	0.00E+00	4.14E-04	3.45E-03
Pyrene	4.50E-04	0.00E+00	0.00E+00	7.67E-05	4.50E-04
Non-HAP Organic Compounds					
Acetone[e]	1.25E-01	0.00E+00		2.92E-04	1.25E-01
Benzaldehyde	1.65E-02	0.00E+00			1.65E-02
Butane	1.01E-01	0.00E+00			1.01E-01
Butyraldehyde	2.40E-02	0.00E+00			2.40E-02
Crotonaldehyde[e]	1.29E-02	0.00E+00			1.29E-02
Ethylene	1.05E+00	0.00E+00		4.43E-03	1.05E+00
Heptane	1.41E+00	0.00E+00			1.41E+00
Hexanal	1.65E-02	0.00E+00			1.65E-02
Isovaleraldehyde	4.80E-03	0.00E+00			4.80E-03
2-Methyl-1-pentene	6.00E-01	0.00E+00			6.00E-01
2-Methyl-2-butene	8.70E-02	0.00E+00			8.70E-02
3-Methylpentane	2.85E-02	0.00E+00			2.85E-02
1-Pentene	3.30E-01	0.00E+00			3.30E-01
n-Pentane[e]	3.15E-02	0.00E+00			3.15E-02
Valeraldehyde[e]	1.01E-02	0.00E+00			1.01E-02
Metals					
Antimony[e]	2.70E-05	0.00E+00			2.70E-05
Arsenic[e]	8.40E-05	0.00E+00			8.40E-05
Barium[e]	8.70E-04	0.00E+00			8.70E-04
Beryllium[e]	0.00E+00	0.00E+00			0.00E+00
Cadmium[e]	6.15E-05	0.00E+00			6.15E-05
Chromium[e]	8.25E-04	0.00E+00			8.25E-04
Cobalt[e]	3.90E-06	0.00E+00			3.90E-06
Copper[e]	4.65E-04	0.00E+00			4.65E-04
Hexavalent Chromium[e]	6.75E-05	0.00E+00			6.75E-05
Manganese[e]	1.16E-03	0.00E+00			1.16E-03
Mercury[e]	3.90E-04	0.00E+00			3.90E-04
Molybdenum[e]	0.00E+00	0.00E+00			0.00E+00
Nickel[e]	9.45E-03	0.00E+00			9.45E-03
Phosphorus[e]	4.20E-03	0.00E+00			4.20E-03
Silver[e]	7.20E-05	0.00E+00			7.20E-05
Selenium[e]	5.25E-05	0.00E+00			5.25E-05
Thallium[e]	6.15E-07				6.15E-07
Vanadium[e]	0.00E+00	0.00E+00			0.00E+00
Zinc[e]	9.15E-03	0.00E+00			9.15E-03

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

A. Drum Mix Plant: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year **3,000** Tons/day
Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane
B. Tank Heater: **0.0000** MMBtu/hr **0** Hours/year **0** hrs/day
Maximum emission for each pollutant from any fuel-burning option selected. Fuels Selected = Natural Gas
C1. Generator G1: **0.00** gal/hour **0** Hours/year #2 Fuel Oil IC Engine <600hp **0** hrs/day
C2. Generator G2: **0.00** gal/hour **0** Hours/year #2 Fuel Oil IC Engine > 600hp **0** 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 **Generator** Max Emission Rate for Pollutant (T/yr)	D **Load-out, Silo Filling, & Tank Storage** Emission Rate for Pollutant (T/yr)	E **POINT SOURCE TOTAL** of Max Emission Rates from A, B, & C (T/yr) Exclude Fugitives (D)
non-PAH HAPs[g]					
Bromomethane[e]				5.99E-05	0.00E+00
2-Butanone (see Methyl Ethyl Ketone)					0.00E+00
Carbon disulfide[e]				8.11E-05	0.00E+00
Chloroethane (Ethyl chloride[e])				1.31E-06	0.00E+00
Chloromethane (Methyl chloride[e])				9.36E-05	0.00E+00
Cumene				6.86E-04	0.00E+00
n-Hexane				0.00E+00	0.00E+00
Methylene chloride (Dichloromethane[e])				0.00E+00	0.00E+00
MTBE					0.00E+00
Styrene[e]				4.55E-05	0.00E+00
Tetrachloroethene (Tetrachloroethylene[e])				4.80E-05	0.00E+00
1,1,1-Trichloroethane (Methyl chloroform[e])				0.00E+00	0.00E+00
Trichloroethene (Trichloroethylene[e])				0.00E+00	0.00E+00
Trichlorofluoromethane				8.11E-06	0.00E+00
m-/p-Xylene[e]				2.56E-03	0.00E+00
o-Xylene[e]				4.99E-03	0.00E+00
Phenol[e,f]				6.03E-04	0.00E+00
Non-HAP Organic Compounds					
Methane				4.05E-02	0.00E+00

e) IDAPA Toxic Air Pollutant

Facility: **Knife River Corporation -Mountain West**

7/27/2020 18:59 **Permit/Facility ID:** **P-2018.0042** **777-00614**

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: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year **3,000** Tons/day 12. hr/day 1,200 hr/yr

Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil (0.0015% S) | Used Oil (0.1000% S) | Natural Gas | LPG/Propane

B. Tank Heater: **0.0000** MMBtu Rate **0** Hours/year **0** hrs/day

Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected = 0.0015% S | Natural Gas

C1. IC Engine 1: **0.00** gal/hour **0** Hours/year IC Engine < 600hp 0.0015% S #2 Fuel Oil **0** hrs/day

C2. IC Engine 2: **0.00** gal/hour **0** Hours/year IC Engine > 600hp 0.0015% S #2 Fuel Oil **0** 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)	5.75	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	
PM-2.5	5.58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-01	
CO	32.50	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.37E-01	
NOx	13.75	0.00E+00	0.00E+00	0.00E+00			
SO_2	4.45	0.00E+00	0.00E+00	0.00E+00			
VOC	8.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.77E-01	
Lead	3.75E-03	0.00E+00					

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)	2.88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.52E-02	
PM-2.5	2.79	0.00E+00	0.00E+00	0	0.00E+00	6.52E-02	
CO							
NOx							
SO_2	2.23	0.00E+00	0.00E+00	0.00E+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)	0.79	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E-02	
PM-2.5	0.76	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.79E-02	
CO							
NOx	1.88	0.00E+00	0.00	0.00			
SO_2	0.61	0.00	0.00E+00	0.00			
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: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year **3,000** Tons/day
Maximum emission for each pollutant from any fuel-burning option selected on "Facility Data" worksheet

B. Tank Heater: **0.0000** MMBtu Rated **0** Hours/year **D. Include all emissions from Load-out/Silo Filling?** **No**
Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet Short Term Source Factor 586 ELs? 1

C1. IC Engine G1: **0.00** gal/hour **0** Hours/year IC Engine <600hp #2 Fuel Oil **0** hrs/day
C2. IC Engine G2: **0.00** gal/hour **0** Hours/year IC Engine > 600hp #2 Fuel Oil **0** 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 Exceed EL Increment?	Modeled? Meets AAC or AACC?
HCl [e]	0.053	0.05	Exceeds	
Dioxins		**Toxic Equivalency Factor[c]**	**Adjusted Emission Rate (lb/hr)**	
2,3,7,8-TCDD	7.19E-12	1.0	7.19E-12	
Total TCDD	3.18E-11	n/a		
1,2,3,7,8-PeCDD	1.06E-11	1.0	1.06E-11	
Total PeCDD	7.53E-10	n/a		
1,2,3,4,7,8-HxCDD	1.44E-11	0.1	1.44E-12	
1,2,3,6,7,8-HxCDD	4.45E-11	0.1	4.45E-12	
1,2,3,7,8,9-HxCDD	3.36E-11	0.1	3.36E-12	
Total HxCDD	4.11E-10	n/a		
1,2,3,4,6,7,8-Hp-CDD	1.64E-10	0.01	1.64E-12	
Total HpCDD	6.51E-10	n/a		
Octa CDD	8.56E-10	0.0003	2.57E-13	
Total PCDD	2.71E-09	n/a		
Furans				
2,3,7,8-TCDF	3.32E-11	0.1	3.32E-12	
Total TCDF	1.27E-10	n/a		
1,2,3,7,8-PeCDF	1.47E-10	0.03	4.42E-12	
2,3,4,7,8-PeCDF	2.88E-11	0.3	8.63E-12	
Total PeCDF	2.88E-09	n/a		
1,2,3,4,7,8-HxCDF	1.37E-10	0.1	1.37E-11	
1,2,3,6,7,8-HxCDF	4.11E-11	0.1	4.11E-12	
2,3,4,6,7,8-HxCDF	6.51E-11	0.1	6.51E-12	
1,2,3,7,8,9-HxCDF	2.88E-10	0.1	2.88E-11	
Total HxCDF	4.45E-10	n/a		
1,2,3,4,6,7,8-HpCDF	2.23E-10	0.01	2.23E-12	
1,2,3,4,7,8,9-HpCDF	9.25E-11	0.01	9.25E-13	
Total HpCDF	3.42E-10	n/a		
Octa CDF	1.64E-10	0.0003	4.93E-14	
Total PCDF	1.37E-09	n/a		
Total PCDD/PCDF	4.11E-09	n/a		
TOTAL Dioxin/Furans[c]	Adjusted lb/hr	TAPs EL for 2,3,7,8 TCDD	**Exceeds TAPs EL?**	**Modeled?**
	1.02E-10	1.50E-10	No	
Non-PAH HAPs				
Acetaldehyde	4.45E-02	3.00E-03	Exceeds	
Acrolein	3.25E-03	0.017	No	
Benzene	1.34E-02	8.00E-04	Exceeds	
1,3-Butadiene				
Ethylbenzene	3.15E-02	29	No	
Formaldehyde	1.06E-01	5.10E-04	Exceeds	
Hexane	1.16E-01	12	No	
Isooctane	5.01E-03			
Methyl Ethyl Ketone	2.75E-03	39.3	No	
Pentane	0.00E+00	118	No	
Propionaldehyde	1.63E-02	0.0287	No	
Quinone	2.00E-02	0.027	No	
Methyl chloroform	6.00E-03	127	No	
Toluene	3.64E-01	25	No	
Xylene	3.13E-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 Exceed EL Increment?	Modeled? Meets AAC or AACC?
PAH HAPs				
2-Methylnaphthalene	6.10E-03	9.10E-05	Exceeds	
3-Methylchloranthrene	0.00E+00	2.50E-06	No	
Acenaphthene	7.83E-05	9.10E-05	No	
Acenaphthylene	7.57E-04	9.10E-05	Exceeds	
Anthracene	1.14E-04	9.10E-05	Exceeds	
Benzo(a)anthracene	9.41E-06			see POM
Benzo(a)pyrene	6.04E-07	2.00E-06	No	see POM
Benzo(b)fluoranthene	4.31E-06			see POM
Benzo(e)pyrene	4.68E-06	9.10E-05	No	
Benzo(g,h,I)perylene	1.59E-06	9.10E-05	No	
Benzo(k)fluoranthene	1.66E-06			see POM
Chrysene	1.82E-05			see POM
Dibenzo(a,h)anthracene	4.32E-08			see POM
Dichlorobenzene	0.00E+00	9.10E-05	No	
Fluoranthene	2.67E-05	9.10E-05	No	
Fluorene	4.67E-04	9.10E-05	Exceeds	
Indeno(1,2,3-cd)pyrene	2.95E-07			see POM
Naphthalene[e]	2.24E-02	9.10E-05	Exceeds	
Perylene	2.87E-06	9.10E-05	No	
Phenanthrene	8.82E-04	9.10E-05	Exceeds	
Pyrene	1.20E-04	9.10E-05	Exceeds	
PolycyclicOrganicMatter[d]	3.45E-05	2.00E-06	Exceeds	
Non-HAP Organic Compounds				
Acetone	1.05E-01	119	No	
Benzaldehyde	1.38E-02			
Butane	8.38E-02			
Butyraldehyde	2.00E-02			
Crotonaldehyde	1.08E-02	0.38	No	
Ethylene	8.95E-01			
Heptane	1.18E+00	109	No	
Hexanal	1.38E-02			
Isovaleraldehyde	4.00E-03			
2-Methyl-1-pentene	5.00E-01			
2-Methyl-2-butene	7.25E-02			
3-Methylpentane	2.38E-02			
1-Pentene	2.75E-01			
n-Pentane[e]	2.63E-02	118	No	
Valeraldehyde (n-Valeraldehyde)	8.38E-03	11.7	No	
Metals				
Antimony[e]	2.25E-05	0.033	No	
Arsenic	1.92E-05	1.50E-06	Exceeds	
Barium	7.25E-04	0.033	No	
Beryllium	0.00E+00	2.80E-05	No	
Cadmium	1.40E-05	3.70E-06	Exceeds	
Chromium	6.88E-04	0.033	No	
Cobalt	3.25E-06	0.0033	No	
Copper	3.88E-04	0.013	No	
Hexavalent Chromium	1.54E-05	5.60E-07	Exceeds	
Manganese	9.63E-04	0.067	No	
Mercury	3.25E-04	0.003	No	
Molybdenum	0.00E+00	0.333	No	
Nickel	2.16E-03	2.70E-05	Exceeds	
Phosphorus	3.50E-03	0.007	No	
Silver	6.00E-05	0.007	No	
Selenium	4.38E-05	0.013	No	
Thallium	5.13E-07	0.007	No	
Vanadium	0.00E+00	0.003	No	
Zinc	7.63E-03	0.667	No	

a) Reserved.

Facility: Knife River Corporation -Mountain West

TAPs MODELING
POUNDS PER HOUR - POINT AND PSEUDO-STACK SOURCES

7/27/2020 18:59 **Permit/Facility ID:** **P-2018.0042** **777-00614**

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: **250** Tons/hour 1,200 Hours/year **300,000** Tons/year **3,000** Tons/day
Maximum emission for each pollutant from any fuel-burning options selected on "Facility Data" worksheet. Fuels Selected = #2 Fuel Oil Used Oil Natural Gas LPG/Propane
B. Tank Heater: **0.0000** MMBtu Rated **0** Hours/year **0** hrs/day
Maximum emission for each pollutant for heater burning any fuel selected on "Facility Data" worksheet. Fuels Selected = Natural Gas
C1. IC Engine: **0.00** gal/hour **0** Hours/year IC Engine < 600hp #2 Fuel Oil **0** hrs/day
C2. IC Engine: **0.00** gal/hour **0** Hours/year IC Engine > 600h #2 Fuel Oil **0** 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]	5.25E-02	0.00E+00	0	0		
Dioxins[e]						
2,3,7,8-TCDD	7.19E-12		0	0		
Total TCDD	3.18E-11		0	0		
1,2,3,7,8-PeCDD	1.06E-11		0	0		
Total PeCDD	7.53E-10		0	0		
1,2,3,4,7,8-HxCDD	1.44E-11	0.00E+00	0	0		
1,2,3,6,7,8-HxCDD	4.45E-11		0	0		
1,2,3,7,8,9-HxCDD	3.36E-11	0.00E+00	0	0		
Total HxCDD	4.11E-10		0	0		
1,2,3,4,6,7,8-Hp-CDD	1.64E-10	0.00E+00	0	0		
Total HpCDD	6.51E-10	0.00E+00	0	0		
Octa CDD	8.56E-10	0.00E+00	0	0		
Total PCDD[h]	2.71E-09	0.00E+00	0	0		
Furans[e]						
2,3,7,8-TCDF	3.32E-11		0	0		
Total TCDF	1.27E-10	0.00E+00	0	0		
1,2,3,7,8-PeCDF	1.47E-10		0	0		
2,3,4,7,8-PeCDF	2.88E-11		0	0		
Total PeCDF	2.88E-09	0.00E+00	0	0		
1,2,3,4,7,8-HxCDF	1.37E-10		0	0		
1,2,3,6,7,8-HxCDF	4.11E-11		0	0		
2,3,4,6,7,8-HxCDF	6.51E-11		0	0		
1,2,3,7,8,9-HxCDF	2.88E-10		0	0		
Total HxCDF	4.45E-10	0.00E+00	0	0		
1,2,3,4,6,7,8-HpCDF	2.23E-10		0	0		
1,2,3,4,7,8,9-HpCDF	9.25E-11		0	0		
Total HpCDF	3.42E-10	0.00E+00	0	0		
Octa CDF	1.64E-10	0.00E+00	0	0		
Total PCDF[h]	1.37E-09	0.00E+00	0	0		
Total PCDD/PCDF[h]	4.11E-09	0.00E+00	0	0		
Non-PAH HAPs						
Acetaldehyde[e]	4.45E-02		0	0		
Acrolein[e]	3.25E-03		0	0		
Benzene[e]	**1.34E-02**	**0.00E+00**	0	0	**0.00E+00**	**7.41E-05**
1,3-Butadiene[e]			0	0		
Ethylbenzene[e]	3.00E-02		0	0	0.00E+00	1.46E-03
Formaldehyde[e]	**1.06E-01**	**0.00E+00**	0	0	**0.00E+00**	**1.25E-04**
Hexane[e]	1.15E-01	0.00E+00	0	0	0.00E+00	7.80E-04
Isooctane	5.00E-03		0	0	0.00E+00	9.36E-06
Methyl Ethyl Ketone[e]	2.50E-03		0	0	0.00E+00	2.55E-04
Pentane[e]		0.00E+00	0	0		
Propionaldehyde[e]	1.63E-02		0	0		
Quinone[e]	2.00E-02		0	0		
Methyl chloroform[e]	6.00E-03		0	0		
Toluene[e]	3.63E-01	0.00E+00	0	0	0.00E+00	1.09E-03
Xylene[e]	2.50E-02		0	0	0.00E+00	6.29E-03
POM (7-PAH Group)	**1.88E-05**	**0.00E+00**		**0.00E+00**	**0.00E+00**	**1.58E-05**

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	**5.82E-03**	**0.00E+00**	0	0	**0.00E+00**	**2.78E-04**
3-Methylchloranthrene[e]	**0.00E+00**	**0.00E+00**	0	0		
Acenaphthene	**4.79E-05**	**0.00E+00**	0	0	**0.00E+00**	**3.04E-05**
Acenaphthylene	**7.53E-04**	**0.00E+00**	0	0	**0.00E+00**	**3.27E-06**
Anthracene	**1.06E-04**	**0.00E+00**	0	0	**0.00E+00**	**8.17E-06**
Benzo(a)anthracene[e]	**7.19E-06**	**0.00E+00**	0	0	**0.00E+00**	**2.22E-06**
Benzo(a)pyrene[e]	**3.36E-07**	**0.00E+00**	0	0	**0.00E+00**	**2.69E-07**
Benzo(b)fluoranthene[e]	**3.42E-06**	**0.00E+00**	0	0	**0.00E+00**	**8.87E-07**
Benzo(e)pyrene	**3.77E-06**	**0.00E+00**	0	0	**0.00E+00**	**9.11E-07**
Benzo(g,h,I)perylene	**1.37E-06**	**0.00E+00**	0	0	**0.00E+00**	**2.22E-07**
Benzo(k)fluoranthene[e]	**1.40E-06**	**0.00E+00**	0	0	**0.00E+00**	**2.57E-07**
Chrysene[e]	**6.16E-06**	**0.00E+00**	0	0	**0.00E+00**	**1.20E-05**
Dibenzo(a,h)anthracene[e]	**0.00E+00**	**0.00E+00**	0	0	**0.00E+00**	**4.32E-08**
Dichlorobenzene	**0.00E+00**	**0.00E+00**	0	0		
Fluoranthene	**2.09E-05**	**0.00E+00**	0	0	**0.00E+00**	**5.84E-06**
Fluorene	**3.77E-04**	**0.00E+00**	0	0	**0.00E+00**	**8.99E-05**
Indeno(1,2,3-cd)pyrene[e]	**2.40E-07**	**0.00E+00**	0	0	**0.00E+00**	**5.49E-08**
Naphthalene[e]	**2.23E-02**	**0.00E+00**	0	0	**0.00E+00**	**1.46E-04**
Perylene	**3.01E-07**	**0.00E+00**	0	0	**0.00E+00**	**2.57E-06**
Phenanthrene	**7.88E-04**	**0.00E+00**	0	0	**0.00E+00**	**9.46E-05**
Pyrene	**1.03E-04**	**0.00E+00**	0	0	**0.00E+00**	**1.75E-05**
Non-HAP Organic Compounds						
Acetone[e]	1.04E-01	0.00E+00	0	0	8.38E-04	2.43E-04
Benzaldehyde	1.38E-02	0.00E+00	0	0		
Butane	8.38E-02	0.00E+00	0	0		
Butyraldehyde	2.00E-02	0.00E+00	0	0		
Crotonaldehyde[e]	1.08E-02	0.00E+00	0	0		
Ethylene	8.75E-01	0.00E+00	0	0	1.68E-02	3.69E-03
Heptane	1.18E+00	0.00E+00	0	0		
Hexanal	1.38E-02	0.00E+00	0	0		
Isovaleraldehyde	4.00E-03	0.00E+00	0	0		
2-Methyl-1-pentene	5.00E-01	0.00E+00	0	0		
2-Methyl-2-butene	7.25E-02	0.00E+00	0	0		
3-Methylpentane	2.38E-02	0.00E+00	0	0		
1-Pentene	2.75E-01	0.00E+00	0	0		
n-Pentane	2.63E-02	0.00E+00	0	0		
Valeraldehyde[e]	8.38E-03	0.00E+00	0	0		
Metals						
Antimony[e]	2.25E-05	0.00E+00	0	0		
Arsenic[e]	**1.92E-05**	**0.00E+00**	0	0		
Barium[e]	7.25E-04	0.00E+00	0	0		
Beryllium[e]	**0.00E+00**	**0.00E+00**	0	0		
Cadmium[e]	**1.40E-05**	**0.00E+00**	0	0		
Chromium[e]	6.88E-04	0.00E+00	0	0		
Cobalt[e]	3.25E-06	0.00E+00	0	0		
Copper[e]	3.88E-04	0.00E+00	0	0		
Hexavalent Chromium[e]	**1.54E-05**	**0.00E+00**	0	0		
Manganese[e]	9.63E-04	0.00E+00	0	0		
Mercury[e]	3.25E-04	0.00E+00	0	0		
Molybdenum[e]	0.00E+00	0.00E+00	0	0		
Nickel[e]	**2.16E-03**	**0.00E+00**	0	0		
Phosphorus[e]	3.50E-03	0.00E+00	0	0		
Silver[e]	6.00E-05	0.00E+00	0	0		
Selenium[e]	4.38E-05	0.00E+00	0	0		
Thallium[e]	5.13E-07	0.00E+00	0	0		
Vanadium[e]	0.00E+00	0.00E+00	0	0		
Zinc[e]	7.63E-03	0.00E+00	0	0		

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

APPENDIX B – AMBIENT AIR QUALITY IMPACT ANALYSIS

M E M O R A N D U M

DATE: July 22, 2020

TO: Christina Boulay, Permit Writer, Air Program

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

PROJECT: P-2020.0008 PROJ 62446, 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.

Contents

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
NOx	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
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
$\mu g/m^3$	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-2020.0008, for operation of a portable hot mix asphalt (HMA) plant in Idaho. The modification would allow a site-specific operational scenario for location near Cascade, 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.

DEQ review of submitted data and DEQ analyses 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 at the Cascade site 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.

The submitted information, 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

- May 12, 2020: Application received by DEQ.
- May 16, 2020: Regulatory start date.
- June 16, 2020: Application determined complete by DEQ.

Table 1. KEY CONDITIONS USED IN MODELING ANALYSES FOR OPERATION AT THE CASCADE SITE	
Criteria/Assumption/Result	**Explanation/Consideration**
Setback from Ambient Air Boundary. No setback distance is required when operating at the Cascade site, provided the HMA is operated as described in the memorandum and emissions points are positioned on the site as described in the application.	A requirement for emission point setback from ambient air was not needed to assure compliance with applicable standards because impact analyses were performed using specific equipment placement on the site and the established ambient air boundary of the site.
Allowable Production. Maximum HMA production does not exceed allowable rates of 250 ton/hour, 3,000 ton/day, and 300,000 ton/year.	Short-term and annual pollutant impact analyses were performed using emissions based on these rates. These rates must not be exceeded.
Annual Relocation Requirement. Air impact analyses were performed considering that the HMA plant may remain at the Cascade site for an indefinite period.	NAAQS compliance is assured for permanent operation at the Cascade site. No relocation requirement is needed for the operational scenario added by this modification.
Operations with Generators. Analyses were performed assuming the HMA will be operated with line power only, and no IC engines will be used at the site to generate power.	NAAQS compliance is not assured if IC engines are used to generate power at the site. Site-specific conditions in the permit should prohibit operation of an IC engine for this scenario.
Seasonal Operations. Air impact analyses were performed using the condition that the HMA plant will not operate during December 1 through March 31.	NAAQS compliance is not assured if operations occur during December 1 - March 31. A permit condition is needed to restrict operations from this period.
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.	Emissions from vehicle traffic must be controlled to a high degree, otherwise compliance with particulate NAAQS has not been demonstrated.
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.	Compliance has not been demonstrated for emissions rates greater than those used in the modeling analyses.
Location with other pollutant emitting equipment. The HMA was modeled with a co-contributing concrete batch plant (CBP) with PTC P-2018.0042 that is operating at the site. Other co-contributing emissions sources such as other HMA plants, another 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 co-contributing rock crushing plant, provided asphalt production is half the daily allowable rate (1,500 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.	Emissions are considered co-contributing if they occur within 1,000 feet (305 meters) of each other. Once the HMA plant is established at the Cascade site, the facility is not responsible for controlling other facilities from moving in nearby, provided they are not on the same property as the permittee. Neighboring facilities would be required to account for the HMA impacts for their own permitting analyses.
Release Parameters for Emission Points. Stack heights are no shorter than what is indicated in this memorandum. Most importantly, the drum dryer stack must be no less than 36 feet. 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 modification of PTC P-2020.0008 for the Knife River portable HMA plant. The modification adds a site-specific operational scenario when operating at 11148 Highway 55, Cascade, Idaho. The site-specific scenario consists of the following:

- A specific equipment configuration at the site, as specified by the applicant;
- Identification of an ambient air boundary at the site, beyond which NAAQS and TAP increment compliance must be met;
- Indefinite operation at the site (no requirement to relocate every 12 months);
- Co-location with a CBP operating under PTC P-2018.0042;
- IC engines will not be used at the site to power generators;
- The plant will operate on a seasonal basis, as required by the existing PTC;
- The drum dryer stack will be at least 36 feet at the point of release to the atmosphere;
- The requirement of an emission point setback from ambient air in the existing permit does not apply for this site-specific scenario, provided emission points are configured as described in this memorandum.

Pollutant-emitting processes conducted at the HMA plant include drum drying aggregate and mixing with asphalt oil, handling of aggregate materials, and handling of produced asphalt.

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 has a significant contribution (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 interpretation[1] (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.

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 6th highest[g]
$PM_{2.5}$[h]	24-hour	1.2	35[i]	Mean of maximum 8th highest[j]
	Annual	0.2	12[k]	Mean of maximum 1st highest[l]
Carbon monoxide (CO)	1-hour	2,000	40,000[m]	Maximum 2nd highest[n]
	8-hour	500	10,000[m]	Maximum 2nd highest[n]
Sulfur Dioxide (SO_2)	1-hour	3 ppb[o] (7.8 μg/m³)	75 ppb[p] (196 μg/m³)	Mean of maximum 4th highest[q]
	3-hour	25	1,300[m]	Maximum 2nd highest[n]
Nitrogen Dioxide (NO_2)	1-hour	4 ppb (7.5 μg/m³)	100 ppb[r] (188 μg/m³)	Mean of maximum 8th highest[s]
	Annual	1.0	100[t]	Maximum 1st highest[n]
Lead (Pb)	3-month[u]	NA	0.15[t]	Maximum 1st highest[n]
	Quarterly	NA	1.5[t]	Maximum 1st 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 to12 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 O_3.
w. Annual 4th highest daily maximum 8-hour concentration averaged over three years.

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.*

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 DEQ for various applicable averaging periods. DEQ's HMA plant emission calculation spreadsheet was used to calculate emissions for the facility, given the specified equipment and requested operational rates. 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. The only emissions considered in this calculation are non-fugitive emissions from the HMA plant, including: the drum dryer, and asphalt silo loading. Emissions from material handling of aggregate and asphalt are considered fugitive, and as such were excluded from permit-applicability PTE.

Table 3. CRITERIA POLLUTANT NAAQS COMPLIANCE DEMONSTRATION APPLICABILITY

Criteria Pollutant	BRC Level (ton/year)	Applicable Facility Wide PTE Emissions (ton/year)	Air Impact Analyses Required?
PM_{10}[a]	1.5	3.6	Yes
$PM_{2.5}$[b]	1.0	3.5	Yes
Carbon Monoxide (CO)	10.0	19.9	Yes
Sulfur Dioxide (SO_2)	4.0	2.7	No
Nitrogen Oxides (NOx)	4.0	8.3	Yes
Lead (Pb)	0.06	0.0023	No
Ozone (as VOC)	4.0	4.8	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 requested operational scenario of the HMA Plant. Attachment 1 provides additional details of DEQ emission calculations used in the impact modeling analyses. Emission rates used in the impact modeling for the co-contributing CBP are also listed in the table.

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 for each hour according to wind speed in the meteorological datafile. Attachment 1 provides details on these emissions calculations.

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	2.788[b]
		Annual	1.142[c]
	PM_{10}	24-hour	2.875[b]
	NOx	1-hour	13.75
		Annual	2.818[c]
	CO	1-hour	32.50
SILOFILL – loading of asphalt storage silo	$PM_{2.5}$	24-hour	0.07324[b]
		Annual	0.03001[c]
	PM_{10}	24-hour	0.07324[b]
	CO	1-hour	0.2950
LOAD – asphalt loadout from silo to truck	$PM_{2.5}$	24-hour	0.06524[b]
		Annual	0.02673[c]
	PM_{10}	24-hour	0.06524[b]
	CO	1-hour	0.3373
LOADCONV – aggregate handling by frontend loader and conveyor transfers	$PM_{2.5}$	24-hour	0.06533[b,d]
		Annual	0.02678[c,d]
	PM_{10}	24-hour	0.4315[b,d]
SCREEN – scalping screen	$PM_{2.5}$	24-hour	0.001560[b]
		Annual	0.0006394[c]
	PM_{10}	24-hour	0.1044[b]
CBPSILO – concrete batch plant, silo loading (cement and supplement)	$PM_{2.5}$	24-hour	0.001875[b]
		Annual	0.0002997
	PM_{10}	24-hour	0.006557[b]
CBPLOAD – concrete batch plant, truck loadout	$PM_{2.5}$	24-hour	0.2956[b]
		Annual	0.04725
	PM_{10}	24-hour	0.4921[b]
CBPHOP – concrete batch plant, sand/aggregate transfer to hopper	$PM_{2.5}$	24-hour	0.007406[b]
		Annual	0.001184
	PM_{10}	24-hour	0.02378[b]
CBPSTOR – concrete batch plant, sand/aggregate transfer to ground storage	$PM_{2.5}$	24-hour	0.007406[b]
		Annual	0.001184
	PM_{10}	24-hour	0.02378[b]
CBPELSTR – concrete batch plant, sand/aggregate transfer to elevated storage	$PM_{2.5}$	24-hour	0.007406[b]
		Annual	0.001184
	PM_{10}	24-hour	0.02378[b]
CBPWBAT – concrete batch plant, weigh batcher loading	$PM_{2.5}$	24-hour	0.02963[b]
		Annual	0.004735
	PM_{10}	24-hour	0.09880[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 24hours/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. 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.

e. Co-contributing source. Emission rates conservatively represent the permit allowable rate rather than actual emissions (actual emissions can be used for a co-contributing source).

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. Emissions from co-contributing sources are not included in project modeling applicability.

Estimated emissions exceed Level I Modeling Thresholds by a considerable margin. Level II Modeling Thresholds are not appropriate for PM_{10} and $PM_{2.5}$ because of the poor dispersion characteristics of fugitive particulate emissions. Level II Modeling Thresholds are questionably appropriate for CO and NOx 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. 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 and annual NOx were substantially below the 175 pound/hour and 14 ton/year Level II Modeling Thresholds, respectively, and project-specific air impact analyses were not performed for CO nor annual NO_2.

Table 5. EMISSION COMPARISONS TO MODELING THRESHOLDS

Pollutant / Averaging Period	Emission Rate[a]	Level I Threshold[b]	Level II Threshold[c]	Project-Specific Air Impact Analyses Required
PM_{10}[d] 24-hour	3.5 lb/hr	0.22 lb/hr	2.6 lb/hr	Yes
$PM_{2.5}$[e] 24-hour	3.0 lb/hr	0.054 lb/hr	0.63 lb/hr	Yes
$PM_{2.5}$[e] annual	3.6 ton/yr	0.35 ton/yr	4.1 ton/yr	Yes
CO[f] 1-hour, 8-hour	33.1 lb/hr	15 lb/hr	175 lb/hr	No[h]
NOx[g] 1-hour	13.8 lb/hr	0.20 lb/hr	2.4 lb/hr	Yes
NOx[g] annual	8.3 ton/yr	1.2 ton/yr	14 ton/yr	No[h]

a. Emission rate in either pounds/hour (lb/hr) 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 thresholdsare not appropriate for $PM_{2.5}$ and PM_{10} emissions.
d. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
e. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
f. Carbon monoxide.
g. Nitrogen oxides.
h. DEQ determined Level II thresholds were appropriate for this pollutant.

Ozone (O_3) differs from other criteria pollutants in that it is not typically emitted directly into the atmosphere. O_3 is formed in the atmosphere through reactions of VOCs, NOx, and sunlight. Atmospheric dispersion models used in stationary source air permitting analyses (see Section 3.3.3) cannot be used to estimate O_3 impacts resulting from VOC and NOx emissions from an industrial facility. O_3 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 O_3 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 NOx are below the 100 tons/year threshold, and DEQ determined it was not appropriate or necessary to require a quantitative source specific O_3 impact analysis.

Secondary Particulate Formation

The impact from secondary particulate formation resulting from emissions of NOx, SO_2, 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 PM_{10} 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 PAH. Therefore, impacts of naphthalene will be greater than other PAHs and demonstrating compliance of naphthalene with the PAH AACC will assure compliance with the other PAHs without the need to model those PAHs. Furthermore, the maximum naphthalene impact was only 26 percent of the AACC.

Table 6. TAP EMISSIONS USED IN DEQ ANALYSES				
TAP	Averaging Period[a]	Emissions (lb/hr)[b]		
		DRYER[c]	SILOFILL[d]	LOAD[e]
Acetaldehyde	Annual	4.45 E-2		
Benzene	Annual	1.34 E-2	1.34 E-4	7.41 E-5
Formaldehyde	Annual	1.06 E-1	2.88 E-3	1.25 E-4
POM[f]	Annual	1.88 E-5	8.80 E-5	1.58 E-5
Arsenic	Annual	1.92 E-5		
Cadmium	Annual	1.40 E-5		
Chromium 6+	Annual	1.54 E-5		
Nickle	Annual	2.16 E-3		
PAH compounds[g]				
Naphthalene	Annual	2.23 E-2	6.02 E-5	1.46 E-4
2-Methylnaphthalene	Annual	8.71 E-3	6.85 E-4	4.16 E-4
Acenaphthene	Annual	7.18 E-5	6.11 E-5	4.55 E-5
Acenaphthylene	Annual	1.13 E-3	1.83 E-6	4.89 E-6
Anthracene	Annual	1.59 E-4	1.69 E-5	1.22 E-5
Fluorene	Annual	5.62 E-4	1.31 E-4	1.34 E-4
Phenanthrene	Annual	1.18 E-3	2.35 E-4	1.42 E-4
Pyrene	Annual	1.54 E-4	5.73 E-5	2.62 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. Loading of asphalt storage silo.
e. Asphalt loadout from storage silo.
f. Polycyclic Organic Matter consisting of a group of seven polyaromatic hydrocarbons (PAHs) as listed in Idaho Air Rules Section 586.
g. 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. Release parameters for the co-contributing CBP are also included in the table. Additional details are provided in Attachment 1.

Asphalt silo filling and loadout were modeled as point sources, rather than volume sources, to account for thermal buoyancy of the emissions plume. Release parameters for asphalt silo filling and loadout were based on the following:

- Release point of asphalt silo filling was set to a typical height of a storage silo (30 feet) and the release point of asphalt loadout operations was set 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^{o}F (1/2 of 325^{o} F = 163^{o} 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**	**UTM Coordinates of Release Point (m)[a]**	**Stack Height (m)[a]**	**Modeled Diameter (m)[a]**	**Stack Gas Temp. (K)[b]**	**Stack Gas Flow Velocity (m/sec)[c]**
DRYER	Point	579727 E, 4925085 N	11.0 (36.0 ft)	1.1 (3.5 ft)	383 (230 ^{o}F)	25.8 (85 fps)
SILOFILL	Point	579700 E, 4925063 N	9.0 (30 ft)	3.0 (9.8 ft)	346 (163 ^{o}F)	0.1
LOAD	Point	579700 E, 4925063 N	3.5 (11.5 ft)	3.0 (9.8 ft)	346 (163 ^{o}F)	0.1
CBPSILO	Raincap	579733 E, 4925124 N	11.6 (38 ft)	0.1 (3.3 ft)	0[d] (-460 ^{o}F)	1.0
Volume Sources						
Release Point /Location	**Source Type**	**UTM Coordinates of Release Point (m)**	**Release Height (m)[a]**	**Initial Horizontal Dispersion Coefficient σ_{y0} (m)**	**Initial Vertical Dispersion Coefficient σ_{z0} (m)**	
LOADCONV	Volume	579740 E, 4925075 N	2.5 (8.2 ft)	4.65	1.16	
SCREEN	Volume	579728 E, 4925077 N	3.0 (9.8 ft)	0.93	2.33	
CBPTLOAD	Volume	579752 E, 4925119 N	3.75 (12.3 ft)	1.16	3.49	
CBPHOP	Volume	579793 E, 4925134 N	3.0 (9.8 ft)	0.7	0.7	
CBPSTOR	Volume	579831 E, 4925108 N	2.0 (6.6 ft)	6.98	0.93	
CBPELSTR	Volume	579755 E, 4925135 N	6.1 (20 ft)	1.63	6.37	
CBPWBAT	Volume	579752 E, 4925119 N	4.9 (16 ft)	1.16	2.33	

a. Meters. 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.
d. A value of 0 K triggers the model to set the release temperature equal to the ambient temperature in the meteorological data file for that hour modeled.

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 Cascade site. 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 ($\mu g/m^3$)[a,b]**
$PM_{2.5}$[c]	24-hour	20.1
	Annual	3.9
PM_{10}[d]	24-hour	55.9
NO_2[e]	1-hour	4.9 (2.6 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.

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

DEQ performed the site-specific air pollutant emissions inventory and air impact analyses based on information submitted from Knife River and general knowledge of HMA plants. 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 site-specific operational scenario for the Knife River HMA plant is for operation at the Cascade site for an indefinite period. Therefore, site-specific data/characteristics were used in air impact analyses, including meteorological data, site layout, and terrain.

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	South of Cascade Idaho	These analyses are only applicable for operation at the Cascade site.
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	Considered	National Elevation Dataset (NED) was acquired from the USGS for the surrounding area. AERMAP version 18081 was used to process terrain elevation data for all buildings and receptors. See Section 3.3.6 for more details.
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	4228 receptors	Adequate to resolve maximum modeled impacts: 10-meter spacing out to 40 meters 25-meter spacing out to 200 meters 50-meter spacing out to 500 meters 100-meter spacing out to 1,000 meters 250-meter spacing out to 5,000 meters

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 NO_2 with ARM2

The atmospheric chemistry of NO, NO_2, and O_3 complicates accurate prediction of NO_2 impacts resulting from NOx emissions. The conversion of NO to NO_2 can be conservatively addressed through the use of several methods as outlined in a *2014 EPA NO_2 Modeling Clarification Memorandum*.[4] The guidance outlines a three-tiered approach:

- Tier 1 – assume full conversion of NO to NO_2 where total NOx emissions are modeled and modeled impacts are assumed to be 100 percent NO_2.
- Tier 2 – use an ambient ratio to adjust impacts from the Tier 1 analysis.
- Tier 3 – use a detailed screening method to account for $NO/NO_2/O_3$ 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 NO_2, in which the conversion of NO to NO_2 is predicted using hourly ambient NOx monitoring data. ARM2 has been adopted by the EPA as a default regulatory Tier 2 option. A minimum and maximum NO_2/NOx ratio of 0.5 and 0.9, respectively, were specified in the model.

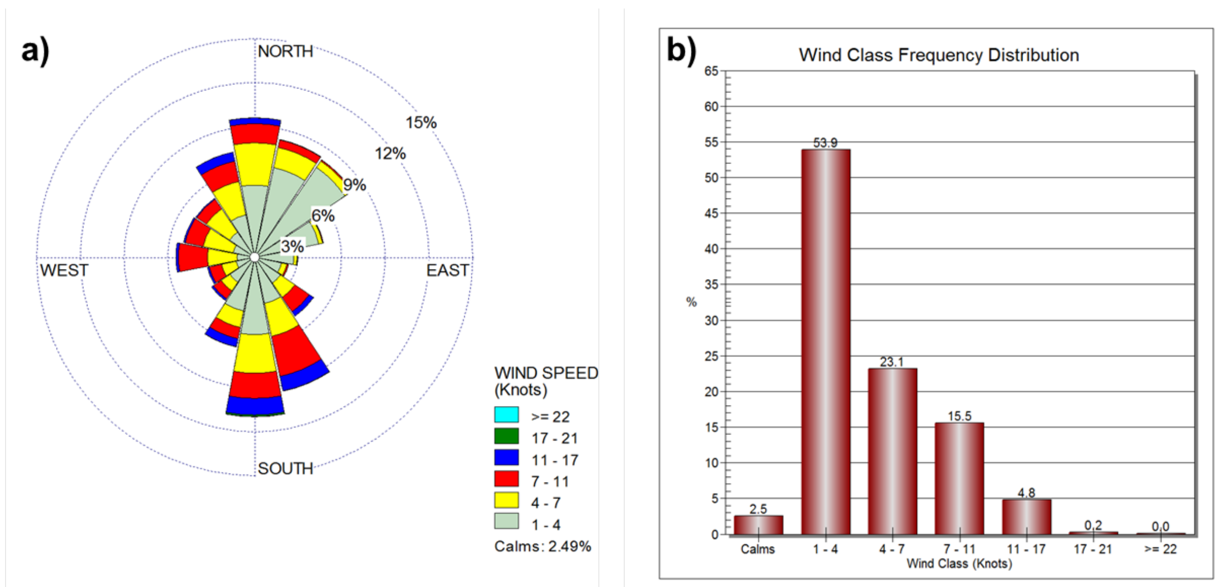
3.3.5 Meteorological Data

DEQ processed a meteorological dataset from McCall, Idaho (KMYL; station ID 725788-94182) covering the years 2011-2016. The year 2013 was not utilized due to significant missing Automated Surface Observing Systems (ASOS) wind data in that time period. The upper air soundings required by AERMET were obtained from the Boise airport station (site ID 24131). Surface characteristics were determined by DEQ staff using AERSURFACE version 13016. DEQ modeling staff evaluated annual moisture conditions for the AERSURFACE runs based on thirty years of McCall airport precipitation data. Conditions were determined to be “average” for 2014, 2015, and 2016; “dry” for 2011; and “wet” for 2012. Average moisture content was defined as within a 30 percentile of the 30-year mean of 24.03

inches. The average wind speed of the data for the five-year period is 4.6 knots per hour, and the percent calm distribution is 2.49%. Calms were relatively low, and less than 1 percent of the data were missing from the 5-year record.

Figure 1 shows a wind rose and wind speed histogram at McCall Airport. AERMINUTE version 15272 was used to process ASOS wind data for use in AERMET. AERMET version 18081 was used to process surface and upper air data and to generate a model-ready meteorological data input file. The “adjust u star” (ADJ_U*) option was applied in AERMET to enhance model performance during low wind speeds under stable conditions. DEQ determined that these data are adequately representative of the meteorology at the Cascade, Idaho, site for minor source permitting.

Figure 1. (a) WIND ROSE AND (b) WIND SPEED HISTOGRAM AT MCCALL AIRPORT IN IDAHO.

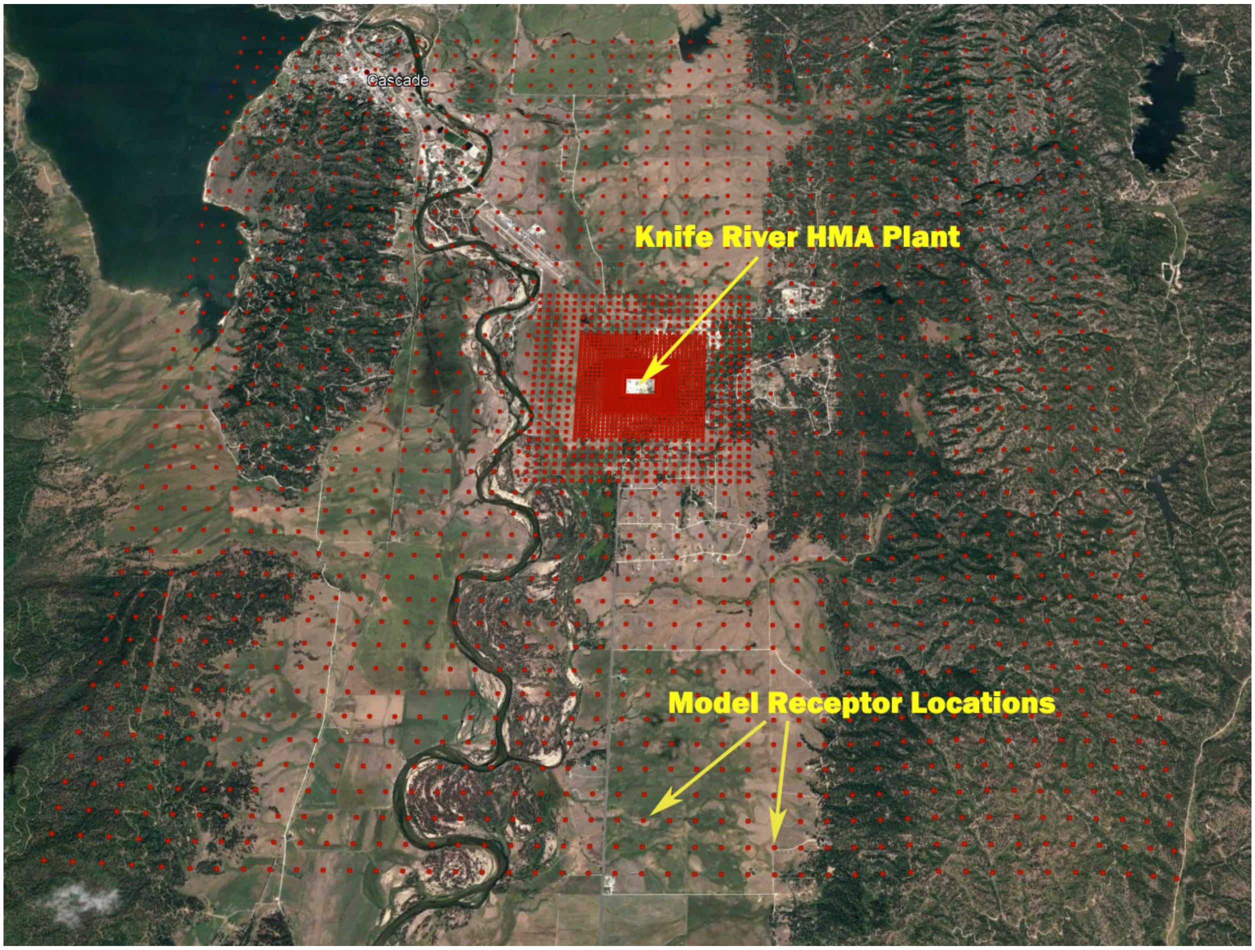


3.3.6 Effects of Terrain on Modeled Impacts

DEQ’s ambient air impact analyses used terrain data extracted from United States Geological Survey (USGS) National Elevation Dataset (NED) files.

The terrain preprocessor AERMAP version 18081 was used to extract the elevations from the NED files and assign them to receptors in the modeling domain in a format usable by AERMOD. AERMAP also determined the hill-height scale for each receptor. The hill-height scale is an elevation value based on the surrounding terrain which has the greatest effect on that individual receptor. AERMOD uses those heights to evaluate whether the emission plume has sufficient energy to travel up and over the terrain or if the plume will travel around the terrain. Figure 2 depicts the full 10-km receptor grid used in the analyses, overlaid on a terrain image from Google Earth.

Figure 2. FACILITY LOCATION AND MODELING DOMAIN



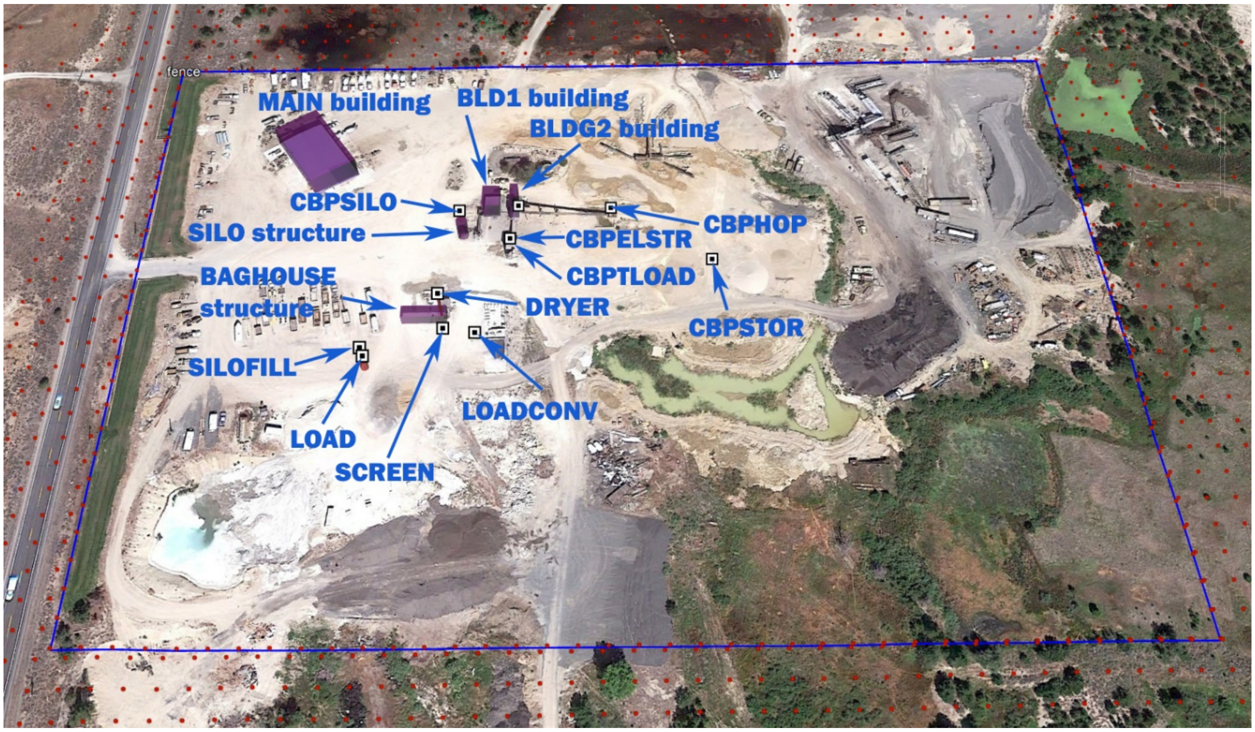
3.3.7 Facility Layout

Knife River provided a facility plot plan with the application showing locations of equipment at the site. DEQ used this information to generate coordinates for emission points as input to the air impact model. Figure 3 shows the placement of structures and emission points used in the model.

3.3.8 Effects of Building Downwash on Modeled Impacts

Identified structures were included in the impact modeling analyses, as shown in Figure 3. Building dimensions were based on information submitted with the application, aerial photographs, and photographs from a street-view (through Google Earth). Table 10 lists the buildings used in the air impact modeling analyses.

Figure 3. STRUCTURE AND EMISSION POINT CONFIGURATION AT THE CASCADE SITE



Tables 4, 6, and 7 provide a description of modeled emission points indicated in this figure and emission quantities of criteria pollutants and TAPs.

Table 10. BUILDING DIMENSIONS USED IN AIR IMPACT MODELING		
Building ID and description	**Horizontal Dimensions (meters)**	**Building Height (meters)**
MAIN – main office building at the northwestern corner of the site.	34 X 19	7.6
BLD1 – CBP building 1	10 X 7	6.1
BLDG2 – CBP building 2	7 X 3	12.2
BAGHOUSE – HMA plant baghouse	17 X 5	4.6
SILO (tank) – cement storage silo	4.3-meter diameter	9.1

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 as areas external to the identified property boundary where the facility is located, assuming that reasonable measures will be taken to preclude public access.

The submitted application provided a facility plot plan with the ambient air boundary identified. The identified ambient air boundary appeared reasonable, based on an overlay on a Google Earth image of the site. DEQ assumes that Knife River will take reasonable measures to preclude public access to the site.

3.3.10 Receptor Network

Table 8 describes the receptor network used in the submitted modeling analyses. The full grid, along with the ambient air boundary receptors, includes a total of 4,228 receptors (Figure 2). The receptor grid used in the impact modeling analyses met the minimum recommendations specified in the *Idaho Air Quality Modeling Guideline*[2], providing good resolution of the maximum design concentrations for the project and extensive coverage. The full receptor grid was used for the NAAQS and TAPs ambient air impact analyses.

DEQ determined that the receptor network was effective in reasonably assuring compliance with applicable air quality standards at all ambient air locations.

3.3.11 Crucial HMA Plant Characteristics Affecting Air Quality Impacts

Table 11 lists characteristics of the HMA plant that are critical to the NAAQS and TAPs compliance demonstrations.

Table 11. IMPORTANT CHARACTERISTIC OF HMA PLANT USED IN DEQ ANALYSES	
Parameter	**Value or Description**
HMA Plant	
HMA Throughput Rates	250 ton/hour, 3,000 ton/day, 300,000 ton/year
Co-Contributing Sources	Impact analyses assumed a co-contributing CBP at the site (PTC P-2018.0042), which was included in these impact modeling analyses. There is also a rock crushing plant on the site. The HMA plant will not be operated at a rate more than 1,500 ton/day during any day when the crushing plant is operated. 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. RFO will have a sulfur content of not more than 0.1%.
Dryer Stack Parameters	Stack height ≥36 ft, stack diameter ≈3.5 ft (effective diameter), gas temp ≥ 230^{o} F, flow velocity ≥85 ft/sec.
Asphalt Silo Filling	It was conservatively 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, remaining at Cascade location for more than 12 months.
Seasonal Restriction	No operations from December 1 through March 31.

4.0 Impact Modeling Results

This section provides results for air impact analyses used to demonstrate compliance with applicable criteria pollutants and TAPs.

4.1 Results for NAAQS Analyses

A NAAQS compliance demonstration was required for PM_{10}, $PM_{2.5}$, and 1-hour NO_2, and DEQ elected to perform a cumulative impact analysis for these pollutants rather than perform initial SIL analyses. The cumulative impact analysis included permit-allowable emissions from the co-contributing CBP on the site. Table 12 provides results for the cumulative NAAQS impact analysis. For each modeled pollutant, the total impact was calculated by adding the design value (DV) of the modeled impact to the ambient background value. The sum was then compared to the NAAQS. Ambient impacts for the facility, when combined with appropriate ambient backgrounds, were below the NAAQS at all modeled receptors.

Table 12. RESULTS FOR CUMULATIVE NAAQS IMPACT ANALYSES

Pollutant	Averaging Period	Modeled Design Value Concentration ($\mu g/m^3$)[a]	Background Concentration ($\mu g/m^3$)	Total Ambient Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Percent of NAAQS
$PM_{2.5}$[b]	24-hour	10.3	20.1	30.4	35	87%
	Annual	1.15	3.9	5.1	12	42%
PM_{10}[c]	24-hour	30.7	55.9	86.6	150	58%
NO_2[d]	1-hour	61.6	4.9	66.5	188	35%

a. Micrograms per cubic meter.
b. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
c. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
d. Nitrogen dioxide.

Figure 4 provides 24-hour $PM_{2.5}$ design value concentrations, including the 20.1 $\mu g/m^3$ background. As shown in the figure, impacts fall off quickly to background levels a short distance from the facility boundary.

4.2 Results for TAPs Impact Analyses

Dispersion modeling was required to demonstrate compliance with TAP increments listed in Idaho Air Rules Section 585 and 586 for those TAPs with project-wide emission increases exceeding screening emission levels (ELs). Table 13 lists the maximum modeled impacts for specific TAPs. All modeled impacts are below applicable AACs and AACCs.

Figure 4. PM2.5 MODELED IMPACT CONTOURS WITH BACKGROUND

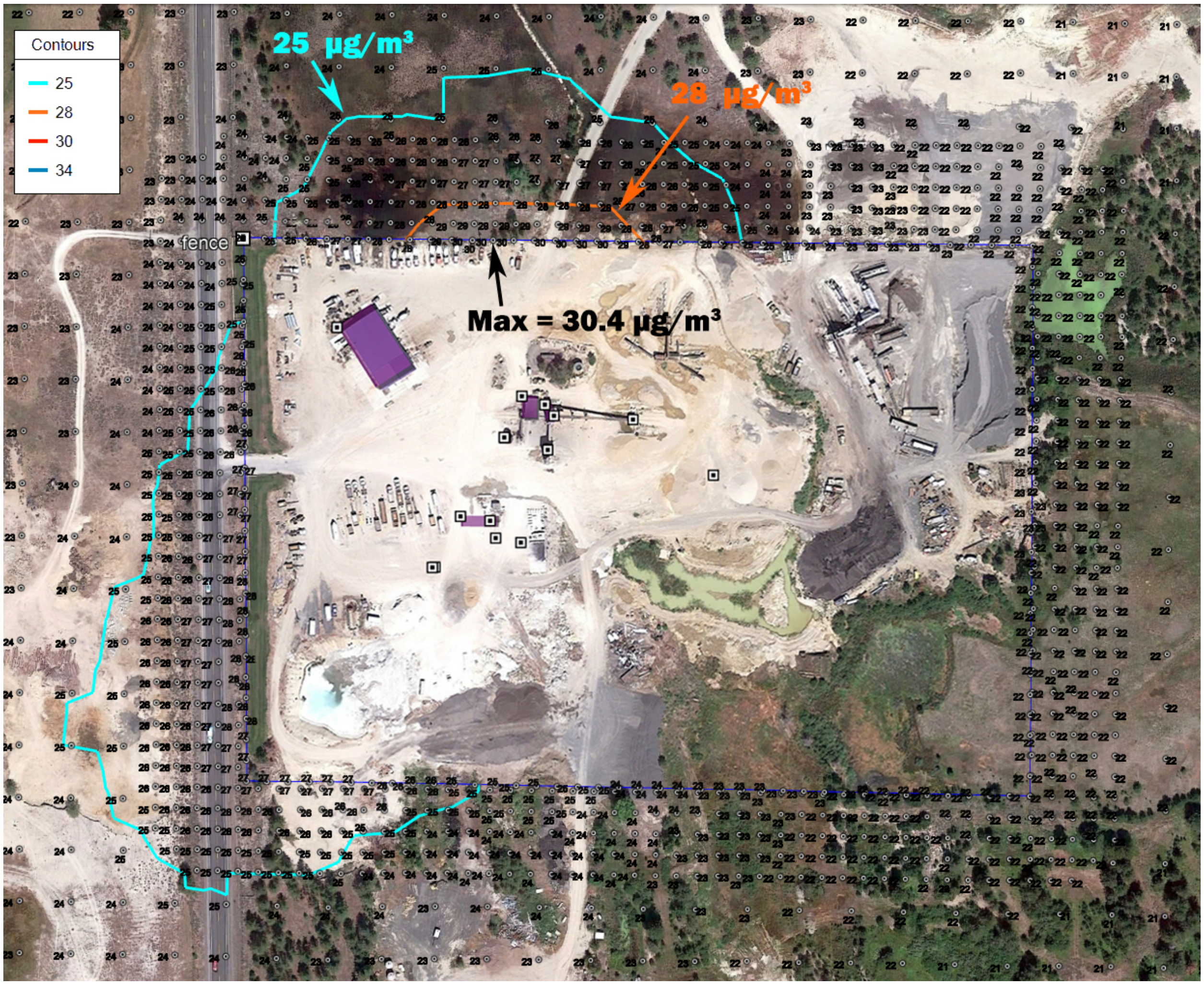


Table 13. TAP AIR IMPACT ANALYSIS RESULTS			
TAP	**Maximum Modeled Impact ($\mu g/m^3$)[a,b]**	**AACC[c] ($\mu g/m^3$)**	**Percent of AACC**
Arsenic (As)	2.78E-6	2.3E-4	1.2
Cadmium (Cd)	2.03E-5	5.6E-4	3.6
Hexavalent Chromium (Cr6+)	2.23E-6	8.3E-5	2.7
Nickel (Ni)	3.13E-4	4.2E-3	7.5
Benzene	2.37E-3	1.2E-1	2.0
Formaldehyde	2.49E-2	7.7E-2	32
Naphthalene as a Polyaromatic Hydrocarbon (PAH)	3.62E-3	1.4E-2	26
Polycyclic Organic Matter (POM)	1.53E-4	3.0E-4	51

a. Micrograms per cubic meter.
b. Modeled impact and AACC represent a period-average (5 years) concentration.
c. Acceptable Ambient Concentration of Carcinogen

4.3 Locating with Other Facilities/Equipment

The air impact analyses performed by DEQ for this site-specific scenario for the Knife River HMA plant accounted for the CBP that also operates at the site, since its impacts cannot be reasonably accounted for by background concentrations used for the location. It is assumed that no other permitted sources will locate on the site, except for a rock crushing plant as described below. 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 would need to 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 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.

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 NO_2 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, and Asphalt Silo Filling

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.

PM_{10} 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:

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

Where:

k = 0.053 for $PM_{2.5}$, 0.35 for PM_{10}
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: $0.053\ (0.0032)\frac{(10/5)^{1.3}}{(3/2)^{1.4}} = 2.367\text{ E-4 lb/ton}$

Base PM_{10} factor – use 10 mph wind: $0.35\ (0.0032)\frac{(10/5)^{1.3}}{(3/2)^{1.4}} = 1.563\text{ E-3 lb/ton}$

Adjustment factors to put in the model:

Cat 1: $(1.72/5)^{1.3}$ (4.702 E-5) = 1.174 E-5 lb/ton
Factor = 1.174 E-5/1.158 E-4 = 0.1014

Cat 2: $(5.18/5)^{1.3}$ (4.702 E-5) = 4.923 E-5 lb/ton
Factor = 4.923 E-5 /1.158 E-4 = 0.4253

Cat 3: $(9.20/5)^{1.3}$ (4.702 E-5) = 1.039 E-4 lb/ton
Factor = 1.039 E-4/1.158 E-4 = 0.8974

Cat 4: $(14.95/5)^{1.3}$ (4.702 E-5) = 1.953 E-4 lb/ton
Factor = 1.953 E-4/1.158 E-4 = 1.687

Cat 5: $(21.28/5)^{1.3}$ (4.702 E-5) = 3.090 E-4 lb/ton
Factor = 3.090 E-4/1.158 E-4 = 2.669

Cat 6: $(27.74/5)^{1.3}$ (4.702 E-5) = 4.362 E-4 lb/ton
Factor = 4.362 E-4/1.158 E-4 = 3.768

For the operational scenario for 3,000 ton/day HMA and 300,000 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 $PM_{2.5}$:

2.367 E-4 lb $PM_{2.5}$	2,880 ton	day	2 transfers	=	0.05681 lb
Ton	day	24 hr			hr

Annual $PM_{2.5}$:

2.367 E-4 lb $PM_{2.5}$	288,000 ton	yr	2 transfers	=	0.02328 lb
Ton	yr	5,856 hour			hr

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

Daily $PM_{2.5}$:

2.367 E-4 lb $PM_{2.5}$	2,880 ton	day	3 transfers	(1-0.90)	=	0.008522 lb
Ton	day	24 hr				hr

Annual $PM_{2.5}$:

2.367 E-4 lb $PM_{2.5}$	288,000 ton	yr	3 transfers	(1-0.90)	=	0.003493 lb
ton	yr	5,856 hour				hr

Total aggregate handling emissions:

Daily $PM_{2.5}$: 0.05681lb/hr + 0.008522 lb/hr = 0.06533 lb/hr
Annual $PM_{2.5}$: 0.02328 lb/hr + 0.003493 lb/hr = 0.02677 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 $PM_{2.5}$:

0.000130 lb PM_{10}	2,880 ton	day	(1-0.90)	=	0.001560 lb
ton	day	24 hour			Hour

Annual $PM_{2.5}$:

0.000130 lb PM_{10}	288,000 ton	year	(1-0.90)	=	0.0006393 lb
ton	year	5,856 hour			hour

HMA Plant Modeling Parameters

Dryer baghouse Stack

Release height = 11.0 meters; effective diameter of release area = 1.1 meters;
typical stack gas temperature = 383 K; typical flow velocity = 26 meters/second

Asphalt Silo Filling

DEQ modeled this source as a point source.
- release height of 9 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^{o} F / 2 = 163^{o} F (346 K)
- stack velocity of 0.1 m/sec to account for convective air flow.

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^{o} F / 2 = 163^{o} 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 3.0 m

Initial dispersion coefficients:

σ_{y0} = 30 m / 4.3 = 6.98 m
σ_{z0} = 5 m / 4.3 = 1.16 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:

σ_{yo} = 4 m / 4.3 = 0.93 m
σ_{zo} = 5 m / 2.15 = 2.33 m

CBP Modeled Emissions Rates and Release Parameters

Aggregate and Sand Handling

A DEQ-developed CBP spreadsheet was used to calculate emissions rates for various averaging periods.

Emissions from aggregate and sand handling were calculated for the following transfers: 1) groundlevel transfers including transfers to a storage pile and transfers to the CBP hopper; 2) transfers to elevated storage.

PM_{10} and $PM_{2.5}$ modeled emissions associated with the handling of aggregate materials were calculated using emissions factors from AP42 Section 13.2.4 *Aggregate Handling and Storage Piles*, then adjusting for the composition of concrete to generate a lb/yd^3 of concrete factor. DEQ's spreadsheet generated a $PM_{2.5}$ factor by multiplying the lb/yd^3 factor for total PM in AP-42, Section 11.12 *Concrete Batching*, by a $PM_{2.5}$ fraction obtained from AP-42, Appendix B.2 *Generalized Particle Size Distributions, Table B-2.2, Category 3*, using a $PM_{2.5}$ fraction of 0.15 (for aggregate handling $PM_{2.5}$ = (PM)(0.15) = (0.0064 lb/yd^3)(0.15) = 0.00096 lb/yd^3). This resulted in a different (and more conservative) $PM_{2.5}/PM_{10}$ ratio than using particle size factors (k) from AP42, Section 13.2.4, which was used for similar material handling sources for the HMA spreadsheet (and the basis of both emission factors was listed AP42 Section 13.2.4). The $PM_{2.5}$ calculation for uncontrolled aggregate handling is shown below, and the generated $PM_{2.5}$ emission factors were 0.0004621 lb/yd^3 for aggregate and 0.0001493 lb/yd^3 for sand.

Emissions were calculated using the following emissions equation:

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

Where:

k = 0.35 for PM_{10} and 0.111 for $PM_{2.5}$ (0.053 for $PM_{2.5}$ is listed in AP42 Section 13.2.4, DEQ's spread sheet assumed $PM_{2.5}$ = (0.15)(PM). k = 0.74 for PM, so k for $PM_{2.5}$ = (0.15)(0.74) = 0.111)
M = moisture content % by weight of material: 1.77% for aggregate and 4.17% for sand
U = wind speed (mph)

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 for aggregate – use 10 mph wind:

$$0.74(0.15)(0.0032)\frac{(10/5)^{1.3}}{(1.77/2)^{1.4}} = 1.038 \text{ E-3 lb/ton}$$

Base $PM_{2.5}$ factor for sand – use 10 mph wind:

$$0.74(0.15)(0.0032)\frac{(10/5)^{1.3}}{(1.77/2)^{1.4}} = 3.127 \text{ E-4 lb/ton}$$

The base PM_{10} emission factors of 3.272 E-3 lb/ton for aggregate and 9.858 E-4 lb/ton for sand was calculated based on the same calculations as $PM_{2.5}$, except using the PM_{10} particle size multiplier of 0.35.

Adjustment factors (based on $PM_{2.5}$ emissions) to put in the model:

Cat 1: $(1.72/5)^{1.3}$ (4.215 E-4) = 1.053 E-4 lb/ton
Factor = 1.053 E-4 / 1.038 E-3 = 0.1014

Cat 2: $(5.18/5)^{1.3}$ (4.215 E-4) = 4.380 E-4 lb/ton
Factor = 4.380 E-4 / 1.038 E-3 = 0.4220

Cat 3: $(9.20/5)^{1.3}$ (4.215 E-4) = 9.312 E-4 lb/ton
Factor = 9.312 E-4 / 1.038 E-3 = 0.8971

Cat 4: $(14.95/5)^{1.3}$ (4.215 E-4) = 1.751 E-3 lb/ton
Factor = 1.751 E-3 / 1.038 E-3 = 1.686

Cat 5: $(21.28/5)^{1.3}$ (4.215 E-4) = 2.770 E-3 lb/ton
Factor = 2.770 E-3 / 1.038 E-3 = 2.669

Cat 6: $(27.74/5)^{1.3}$ (4.215 E-4) = 3.910 E-3 lb/ton
Factor = 3.910 E-3 / 1.038 E-3 = 3.768

1 yd^3 of concrete ≈ 4024 lbs, consisting of:
1865 lbs aggregate
1428 lbs sand
491 lbs cement
73 lbs supplement
20 gal of water

Fraction of aggregate = 1865 lb / 4024 lb = 0.4635
Fraction of sand = 1428 lb / 4024 lb = 0.3549

Base $PM_{2.5}$ factor for aggregate in terms of lb/yd^3

1.038 E-3 lb $PM_{2.5}$	0.4635 ton agg	ton	4,024 lb conc.	=	9.680 E-4 lb $PM_{2.5}$
ton	ton concrete	2,000 lb	yd^3		yd^3

Base $PM_{2.5}$ factor for sand in terms of lb/yd^3

3.127 E-4 lb $PM_{2.5}$	0.3549 ton sand	ton	4,024 lb conc.	=	2.233 E-4 lb $PM_{2.5}$
ton	ton concrete	2,000 lb	yd^3		yd^3

The PM_{10} factor for aggregate is 3.051 E-3 lb PM_{10}/yd^3 and for sand is 7.039 E-4 lb PM_{10}/yd^3.
Assume moderate fugitive dust controls reduce emissions by an additional 75%.

Base controlled $PM_{2.5}$ factor for aggregate in terms of lb/yd^3

9.680 E-4 lb $PM_{2.5}$	(1-0.75)	=	2.420 E-4 lb $PM_{2.5}$
yd^3			yd^3

Base controlled $PM_{2.5}$ factor for sand in terms of lb/yd^3

2.233 E-4 lb $PM_{2.5}$	(1-0.75)	=	5.583 E-5 lb $PM_{2.5}$
yd^3			yd^3

Controlled PM_{10} factors for aggregate handling is 7.628 E-4 lb PM_{10}/yd^3 and for sand handling is 1.760 E-4 lb PM_{10}/yd^3.

There are two groundlevel transfers of aggregate and sand: 1) transfer to a storage pile; 2) transfer from a pile to the hopper. There is one transfer to elevated storage.

For the operational scenario for 600 cy/day concrete and 35,000 cy/year concrete, $PM_{2.5}$ emissions from aggregate and sand transfers are as follows:

Material Transfer Emissions/Transfer:

Daily $PM_{2.5}$:

2.420 E-4 lb + 5.583 E-5 lb	600 yd^3	day	=	0.007443 lb $PM_{2.5}$
yd^3 - transfer	day	24 hr		hr - transfer

Annual $PM_{2.5}$:

2.420 E-4 lb + 5.583 E-5 lb	35,000 yd^3	yr	=	0.001190 lb $PM_{2.5}$
yd^3 - transfer	yr	8.760 hr		hr

Daily $PM_{2.5}$:

7.628 E-4 lb + 1.760 E-4 lb	600 yd^3	day	=	0.02347 lb $PM_{2.5}$

yd^3 - transfer	day	24 hr	hr - transfer

Transfer to Ground Level Storage

1 transfer of aggregate and sand

These sources were modeled as a single volume source in a 30-meter by 30-meter area with a 4-meter depth. The release height was set at 2.0 m. The initial dispersion coefficients were calculated using AERMOD guidance for volume sources as follows:

σ_{yo} = 30.0 m / 4.3 = 6.977 m
σ_{zo} = 4.0 m / 4.3 = 0.93 m

Transfer to Hopper:

1 transfer of aggregate and sand

These sources were modeled as a single volume source in a 3.5-meter by 3.5-meter area with a 3-meter depth. The release height was set at 3.0 m. The initial dispersion coefficients were calculated using AERMOD guidance for volume sources as follows:

σ_{yo} = 3.0 m / 4.3 = 0.7 m
σ_{zo} = 3.0 m / 4.3 = 0.7 m

Transfer to Elevated Storage:

1 transfer of aggregate and sand

These sources were modeled as a single volume source on a building 7-meter by 7-meter, and 13.7 meter (45 feet) high. The release height was set at 6.1 meters (20 feet). Dimensions were based on areal and street views on Google Earth. The initial dispersion coefficients were calculated using AERMOD guidance for volume sources as follows:

σ_{yo} = 7.0 m / 4.3 = 1.63 m
σ_{zo} = 13.7 m / 2.15 = 6.37 m

Cement and Supplement Silo Filling

A DEQ-developed CBP spreadsheet was used to calculate emissions rates for various averaging periods. Emissions are controlled by a baghouse.

A Stack height 11.6 meter (38 feet) for the cement and supplement silo of the CBP was provided in the CBP permit application. DEQ conservatively modeled the release at 0.0 Kelvin to eliminate buoyancy flux. Other stack parameters of 0.1 meter (0.3 feet) diameter, and 1 meter/second flow velocity were conservatively estimated by DEQ based on similar sources.

Weigh Hopper Loading Baghouse

A DEQ-developed CBP spreadsheet was used to calculate emissions rates for various averaging periods. Emissions were assumed to be uncontrolled.

This source was modeled as a single volume source on a building 5-meter by 5-meter, and 5 meter high. The release height was set at 4.9 meters (16 feet). Dimensions were based on areal and street views on Google Earth. The initial dispersion coefficients were calculated using AERMOD guidance for volume sources as follows:

σ_{yo} = 5.0 m / 4.3 = 1.16 m
σ_{zo} = 5.0 m / 2.15 = 2.33 m

Truck Loadout Emissions

A DEQ-developed CBP spreadsheet was used to calculate emissions rates for various averaging periods. Emissions from mixer truck loading are controlled by a shroud by 75 percent.

Emissions from truck loadout of dry concrete, fly ash, and aggregate were modeled as a volume source. The release height was set at 3.75 meters, the typical height of cement truck feed chutes. The initial horizontal dimension (σ_{yo}) was set at a value equal to the length of the source's side divided by 4.3, as directed by EPA guidance for AERMOD[3]. The length of side was set to 5 meters to represent the structure of the plant and any adjacent building. The initial vertical dimension (σ_{zo}) was set at a value equal to the vertical extent of the source or the height of an adjacent building divided by 2.15, as directed by EPA guidance for AERMOD. The vertical extent was set at two times the release height or 7.5 meters.

σ_{yo} = 5 m / 4.3 = 1.16 m
σ_{zo} = 7.5 m / 2.15 = 3.49 m

APPENDIX C – 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 West Gowen Road**
City:	**Boise**
State:	**Idaho**
Zip Code:	**83709**
Facility Contact:	**Joseph Smith**
Title:	**Regional Environmental Manager**
AIRS No.:	**324121**

Y	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	**$ 500.00**		

Comments: