

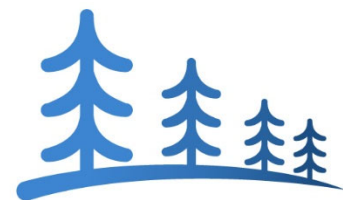


**Manh Choh**  
A JV with Contango ORE

# **Manh Choh Trucking: Impacts on Fairbanks North Star Borough PM-2.5 Nonattainment Area**

Prepared for:  
Peak Gold, LLC

**Revision 1 – December 2022**



**B O R E A L**

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## 1.0 INTRODUCTION

Peak Gold, LLC (Peak Gold) proposes to develop the Manh Choh Project near Tok, Alaska. A key component of this development is to truck coarse ore from the Manh Choh minesite to the Kinross Fort Knox Mine north of Fairbanks. Trucking would transect the Fairbanks North Star Borough (FNSB) PM<sub>2.5</sub> nonattainment area (PM<sub>2.5</sub> NAA) in each direction.

The Alaska Department of Environmental Conservation (ADEC) is responsible for developing a strategy as part of the State Implementation Plan (SIP) to bring the PM<sub>2.5</sub> NAA into attainment using various tools to reduce and otherwise manage air emissions. The ADEC SIP attainment strategy has been developed in part based on modeling emissions throughout the PM<sub>2.5</sub> NAA.

As part of its evaluation of environmental impacts of the Manh Choh Project, Peak Gold retained Boreal Environmental Services (Boreal) of Anchorage, Alaska to characterize the potential PM<sub>2.5</sub> impacts from Manh Choh trucking activities on the PM<sub>2.5</sub> NAA once the project moves forward. This report was prepared to support environmental assessment in August 2022. Revision 1 reflects updated emission estimates.

## 2.0 KEY TRUCKING PARAMETERS

Peak Gold has formulated a plan to provide ore trucking services between Manh Choh and Fort Knox. The plan includes purchasing a fleet of new highway trucks that have the latest technology for meeting U.S. Environmental Protection Agency (EPA) emission requirements. Key parameters for trucking are provided in Table 1.

**Table 1 – Design Basis for Trucking in PM<sub>2.5</sub> NAA**

Parameter	Design Basis
Ore produced and trucked per day	4,000 tons/day
Ore tons per highway trip	50 tons/trip
Truck weight – empty (truck + trailers)	63,000 lbs = 31.5 tons
Trips per day	Design: 80 round trips (Expected: 60 round trips)
ADOT-recommended trucking route through PM <sub>2.5</sub> NAA	Richardson Highway to Mitchell Expressway to Peger Road to Johansen Expressway to Steese Highway
Distance within PM <sub>2.5</sub> NAA following ADOT route	32.5 miles (one way)
Truck type and engine	Kenworth T880 Tri-Drive with X15 Productivity Cummins Engine
Engine power rating	605 hp
Engine emissions rating	Heavy Duty Highway Diesel – EPA 2021
Fuel type	Ultra Low Sulfur Diesel (ULSD)
Truck fuel consumption – empty	5 miles/gal
Truck fuel consumption – full	3.3 miles/gal



The proposed route through the FNSB PM<sub>2.5</sub> NAA is about 32.5 miles each way by a route recommended by the Alaska Department of Transportation (ADOT) as the best commercial trucking route through Fairbanks. The PM<sub>2.5</sub> NAA and ADOT's recommended trucking route are shown in Figure 1.

EPA's PM<sub>2.5</sub> and precursor emissions standards for model year 2021 heavy duty highway diesel trucks (see 40 CFR 86.007-11) are provided in Table 2.

**Table 2 – EPA Model Year 2021 Emission Standards for Heavy Duty Highway Diesel Trucks**

Pollutant	Emission Standard
PM <sub>2.5</sub>	0.01 g/hp-hr
NO <sub>x</sub>	0.2 g/hp-hr
SO <sub>2</sub>	0.0002 lb/gal (ULSD)
VOCs	0.14 g/hp-hr

### 3.0 EMISSIONS WITHIN PM<sub>2.5</sub> NAA

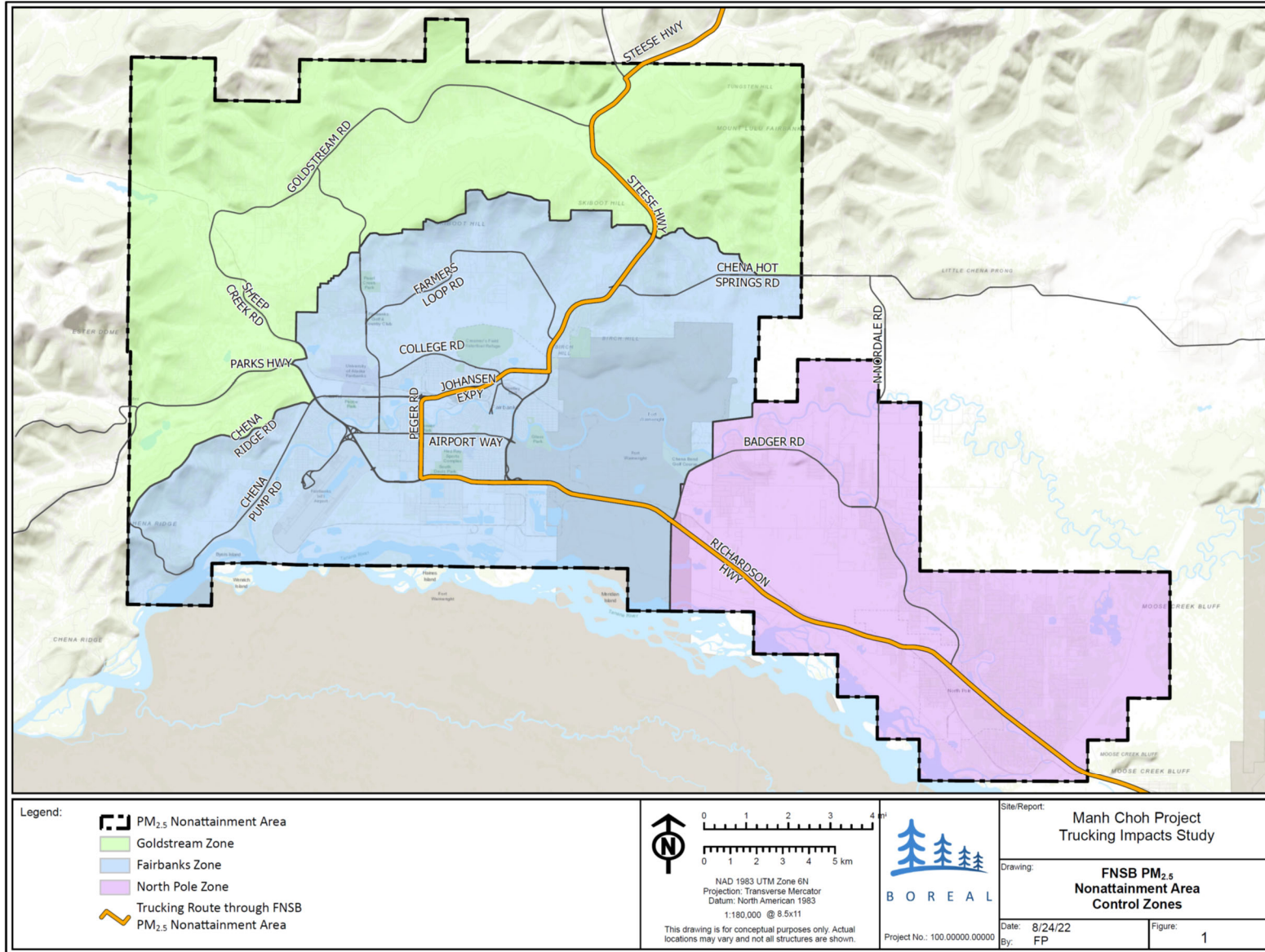
Based on the parameters in Section 2, Boreal modeled trucking emissions within the PM<sub>2.5</sub> NAA. Results are summarized below; supporting spreadsheets are provided in Appendix A.

**Table 3 – Daily Emissions in PM<sub>2.5</sub> NAA**

Pollutant	Estimated Total Daily Emissions in NAA (tons/day)
PM <sub>2.5</sub>	0.0037
NO <sub>x</sub>	0.0053
SO <sub>2</sub>	0.0001
VOCs	0.0037



Figure 1 – Trucking Route



D:\GIS\Projects\Manh Choh Mine\APRX\Manh Choh Mine.aprx



## 4.0 EMISSIONS CHARACTERIZATION

To characterize the emissions from Manh Choh trucking, Boreal benchmarked trucking emissions compared to the Alaska SIP emissions budget and to General Conformity requirements for federal actions.

### 4.1 TRUCKING EMISSIONS COMPARED TO SIP EMISSIONS BUDGET

The PM<sub>2.5</sub> NAA issue in the FNSB is based on difficulties meeting the 24-hour PM<sub>2.5</sub> national ambient air quality standard (NAAQS) in the winter. As such, Fairbanks SIP planners focus on modeling wintertime 24-hour episodic emissions of PM<sub>2.5</sub> and precursors to develop a plan for coming back into attainment of the 24-hour PM<sub>2.5</sub> NAAQS. Boreal’s calculated maximum 24-hour emissions are provided in Table 3 above.

For comparison, Boreal used the most currently available Alaska SIP episode planning emissions values for the PM<sub>2.5</sub> NAA in 2024 found in the State Air Quality Control Plan amendments adopted through November 18, 2020. Based on these SIP values, the table below shows that Manh Choh trucking emissions in the NAA would increase the total NAA SIP emissions budget for PM<sub>2.5</sub> and each precursor by much less than half of one percent. Compared to mobile source emissions only, Manh Choh would increase the emissions budget by less than one percent for each pollutant. Although Peak Gold expects to average 60 truck round trips per day, modeling is based on the assumption of 80 round trips per day.

**Table 4 – Daily Winter Manh Choh Emissions Compared to SIP Emissions Budget**

Pollutant	Estimated Total Daily Emissions in NAA (t/d)	Alaska SIP Emissions Budget in NAA – All Sources (t/d)	Manh Choh Percentage	Alaska SIP Emissions Budget in NAA – Mobile Only (t/d)	Manh Choh Percentage
PM <sub>2.5</sub>	0.0037	1.9900	0.19%	0.4000	0.93%
NO <sub>x</sub>	0.0053	16.2400	0.03%	2.2700	0.23%
SO <sub>2</sub>	0.0001	10.7100	0.00%	5.6000	0.00%
VOCs	0.0037	18.0600	0.02%	7.1900	0.05%

### 4.2 GENERAL CONFORMITY FOR FEDERAL ACTIONS

“General Conformity” is a set of regulations that prevent federal agencies from taking actions that do not conform to the SIP. Among other things, agencies cannot interfere with the State’s plan for attainment. General Conformity serves as a benchmark for determining whether impacts are material, and, if so, how to move forward without worsening existing violations of the NAAQS.

Using the latest trucking assumptions above and the ADOT route, Table 5 below provides Peak Gold’s annual estimates of direct and indirect emissions of PM<sub>2.5</sub> and precursors from ore trucks within the



boundaries of the NAA. These estimates are compared to the General Conformity de minimis values found in 40 CFR 93.153(b)(1).

EPA designed the de minimis values for actions (in this case, Manh Choh trucking through the NAA) that are so small they are immaterial and therefore exempt from further analysis to demonstrate they will not interfere with SIP attainment plans. As shown in the table below, Manh Choh trucking emissions in the NAA are very small (less than 5 percent in all cases) compared to the General Conformity de minimis limits. Any federal agency obligations under General Conformity for Manh Choh are met simply by the insignificant contribution of emissions within the NAA. In other words, under federal regulations, Manh Choh trucking emissions are immaterial to SIP attainment plans.

**Table 5 – General Conformity Applicability**

Pollutant	Manh Choh Max Annual Trucking Emissions in Fairbanks North Star Borough PM <sub>2.5</sub> NAA (tons/year)				General Conformity De Minimis (tons/year)	Exempt from General Conformity?
	Tailpipe	Paved Road Particulate Suspension	Brake and Tire Wear	Total		
PM <sub>2.5</sub>	0.10	1.20	0.07	1.36	70	Yes
NO <sub>x</sub>	1.94			1.94	70	Yes
SO <sub>2</sub>	0.05			0.05	70	Yes
VOCs	1.36			1.36	70	Yes

## 5.0 CONCLUSIONS

Based on the foregoing, Boreal concludes the following:

- ❖ Peak Gold trucking of Manh Choh ore will have an insignificant contribution to overall emissions in the FNSB PM<sub>2.5</sub> NAA.
- ❖ Emissions from Manh Choh trucking are so small that any federal approvals required for Manh Choh are exempt from General Conformity.





# Appendix A

## Emission Calculation Spreadsheets

**Table 1a. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Emissions Summary and General Conformity Applicability**

Pollutant	Total Estimated Annual Emissions in Nonattainment Area (tpy)	General Conformity De Minimis Thresholds (tpy)	Does General Conformity Apply?
NO <sub>x</sub>	1.94	70 (precursor)	No
SO <sub>2</sub>	0.05	70 (precursor)	No
VOC	1.36	70 (precursor)	No
PM <sub>2.5</sub>	1.36	70 (serious nonattainment)	No
Ammonia	trace	70 (precursor)	No

**Table 1b. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Percentage of Alaska SIP Episode Planning Emissions**

Pollutant	Total Estimated Daily Emissions in Nonattainment Area (tpd)	Alaska SIP Episode Planning Emissions in Nonattainment Area (tpd) <sup>1</sup>	Manh Choh Percentage	Alaska SIP Episode Planning Emissions in Nonattainment Area (On-Road & Non-Road Only) <sup>1</sup>	Manh Choh Percentage
NO <sub>x</sub>	0.0053	16.2400	0.03%	2.2700	0.23%
SO <sub>2</sub>	0.0001	10.7100	0.00%	5.6000	0.00%
VOCs	0.0037	18.0600	0.02%	7.1900	0.05%
PM <sub>2.5</sub>	0.0037	1.9900	0.19%	0.4000	0.93%
Ammonia	trace	0.3060	trace	0.0450	trace

**Notes:**

<sup>1</sup> Alaska SIP Episode Planning Emissions values are the 2024 control episode average daily emissions provided in State Air Quality Control Plan Vol.II: III.D.7.06 Amendments Adopted November 18, 2020, page III.D.7.6-124.

**Table 2. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Emissions Unit Inventory**

Emissions Units						Maximum Fuel Consumption
Description	Make/Model	Classification	Location	Rating/Size	Fuel	
<b>Fugitive Sources</b>						
Paved Roads	N/A <sup>1</sup>	Fugitive	Alaska Highway	N/A	N/A	N/A
<b>Mobile Sources</b>						
Buses (4 trips/week; 3.26 mpg avg)	TBD	On-Road	Alaska Highway	10,192 mile/yr	ULSD <sup>2</sup>	3,126 gal/yr
Highway Haul Trucks (80 trips/day; 4.15 mpg avg) <sup>3</sup>	T880 Tri-Drive X15 Productivity	On-Road	Alaska Highway	1,898,000 mile/yr	ULSD	457,349 gal/yr

**Notes:**

<sup>1</sup> Not applicable.

<sup>2</sup> Ultra-Low Sulfur Diesel (15 ppmw).

<sup>3</sup> Highway Truck Calculation Details -T880 Tri-Drive X15 Productivity (2021 Cummins Engine):

Ore produced per day:	4,000 tpd
Ore tons per highway trip:	50 tons
Trips per day:	80 trips
Engine Power Rating:	605 hp
Truck empty rate:	63,000 lbs (truck and trailer)
Truck fuel consumption empty:	5 mpg
Truck fuel consumption full:	3.3 mpg avg
Route in NAA (one way):	32.5 miles

**Table 3. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Nitrogen Oxides (NO<sub>x</sub>) Emissions Summary**

Emissions Units			Maximum Fuel Consumption	Emission Factor		Annual NO <sub>x</sub> Emissions
Description	Classification	Fuel		Units	Reference	
<b>Fugitive Sources</b>						
Paved Roads	Fugitive	N/A	N/A	N/A	N/A	0 tpy
<b>Mobile Sources</b>						
Buses (4 trips/week; 3.26 mpg avg)	On-Road	ULSD	3,126 gal/yr	0.2 g/hp-hr	40 CFR 86.007-11	0.01 tpy
Highway Haul Trucks (80 trips/day; 4.15 mpg avg)	On-Road	ULSD	457,349 gal/yr	0.2 g/hp-hr	40 CFR 86.007-11	1.92 tpy
<b>Total Estimated NO<sub>x</sub> Emissions</b>						<b>1.94 tpy</b>

**Notes:**

<sup>1</sup> Calculations use diesel fuel conversions of 18,800 Btu/lb liquid fuel, 7.1 lb liquid fuel/gal, and 7,000 Btu/hp-hr.

**Table 4. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Sulfur Dioxide (SO<sub>2</sub>) Emissions Summary**

Emissions Units			Maximum Fuel Consumption	Emission Factor		Annual SO <sub>2</sub> Emissions
Description	Classification	Fuel		Units	Reference	
<b>Fugitive Sources</b>						
Paved Roads	Fugitive	N/A	N/A	N/A	N/A	0 tpy
<b>Mobile Sources</b>						
Buses (4 trips/week; 3.26 mpg avg)	On-Road	ULSD	3,126 gal/yr	0.0002 lb/gal	Mass Balance	0.0003 tpy
Highway Haul Trucks (80 trips/day; 4.15 mpg avg)	On-Road	ULSD	457,349 gal/yr	0.0002 lb/gal	Mass Balance	0.05 tpy
<b>Total Estimated SO<sub>2</sub> Emissions</b>						<b>0.05 tpy</b>

**Notes:**

<sup>1</sup> Calculations use diesel fuel conversions of 18,800 Btu/lb liquid fuel, 7.1 lb liquid fuel/gal, 7,000 Btu/hp-hr, and 1.341 hp/kW.

**Table 5. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Volatile Organic Compounds (VOC) Emissions Summary**

Emissions Units			Maximum Fuel Consumption	Emission Factor		Annual VOC Emissions
Description	Classification	Fuel		Units	Reference	
<b>Fugitive Sources</b>						
Paved Roads	Fugitive	N/A	N/A	N/A	N/A	0 tpy
<b>Mobile Sources</b>						
Buses (4 trips/week; 3.26 mpg avg)	On-Road	ULSD	3,126 gal/yr	0.14 g/hp-hr	40 CFR 86.007-11	0.009 tpy
Highway Haul Trucks (80 trips/day; 4.15 mpg avg)	On-Road	ULSD	457,349 gal/yr	0.14 g/hp-hr	40 CFR 86.007-11	1.35 tpy
<b>Total Estimated VOC Emissions</b>						<b>1.36 tpy</b>

**Notes:**

<sup>1</sup> Calculations use diesel fuel conversions of 18,800 Btu/lb liquid fuel, 7.1 lb liquid fuel/gal, 7,000 Btu/hp-hr, and 1.341 hp/kW.

**Table 6. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Particulate Matter (PM<sub>2.5</sub>) Emissions Summary**

Emissions Units			Maximum Fuel Consumption	Emission Factor		Annual PM <sub>2.5</sub> Emissions
Description	Classification	Fuel		Units	Reference	
<b>Fugitive Sources</b>						
Paved Roads	Fugitive	N/A	N/A	N/A	See Table 7	1.3 tpy
<b>Mobile Sources</b>						
Buses (4 trips/week; 3.26 mpg avg)	On-Road	ULSD	3,126 gal/yr	0.01 g/hp-hr	40 CFR 86.007-11	0.001 tpy
Highway Haul Trucks (80 trips/day; 4.15 mpg avg)	On-Road	ULSD	457,349 gal/yr	0.01 g/hp-hr	40 CFR 86.007-11	0.10 tpy
<b>Total Estimated PM<sub>2.5</sub> Emissions</b>						<b>1.36 tpy</b>

**Notes:**

<sup>1</sup> Calculations use diesel fuel conversions of 18,800 Btu/lb liquid fuel, 7.1 lb liquid fuel/gal, and 7,000 Btu/hp-hr.

**Table 7. Peak Gold, LLC - Manh Choh Project - Fairbanks North Star Borough PM<sub>2.5</sub> Nonattainment Area  
Paved Roads Particulate Matter (PM<sub>2.5</sub>) Emissions Summary**

Vehicle / Parameter	Silt Loading <sup>1</sup>	Vehicle Weight	Distance Traveled <sup>2</sup>	Emission Factor		Annual PM <sub>2.5</sub> Emissions
				Units	Reference	
Buses	0.03 g/m <sup>2</sup>	10 tons	10,192 VMT/yr	0.0002 lb/VMT <sup>3</sup>	Section 13.2.1, AP-42	0.00 tpy <sup>4</sup>
Highway Haul Trucks (full)	0.03 g/m <sup>2</sup>	81.5 tons	949,000 VMT/yr	0.0020 lb/VMT <sup>3</sup>	Section 13.2.1, AP-42	0.87 tpy <sup>4</sup>
Highway Haul Trucks (empty)	0.03 g/m <sup>2</sup>	31.5 tons	949,000 VMT/yr	0.0007 lb/VMT <sup>3</sup>	Section 13.2.1, AP-42	0.33 tpy <sup>4</sup>
Brake Wear - Combination Long Haul Truck	N/A	N/A	1,908,192 VMT/yr	26.6 mg/VMT <sup>5</sup>	MOVES2014	0.06 tpy
Tire Wear - Combination Long Haul Truck	N/A	N/A	1,908,192 VMT/yr	5.2 mg/VMT <sup>5</sup>	MOVES2014	0.01 tpy
<b>Total Estimated PM<sub>2.5</sub> Emissions</b>						<b>1.3 tpy</b>

**Notes:**

<sup>1</sup> Silt loading per AP-42 Table 13.2.1-2 (ADL greater than 10,000).

<sup>2</sup> VMT means Vehicle Mile Traveled.

<sup>3</sup> Emission factors for paved road particulate emissions from AP-42 Section 13.2.1:

$$E = k (sL)^{0.91} (W)^{1.02} \quad \text{Equation (1)}$$

Where:

E = Annual average particulate emission factor, lb/VMT

k = Particle size multiplier per AP-42 Table 13.2.1-1 (0.011 for PM; 0.0022 for PM<sub>10</sub>; 0.00054 for PM<sub>2.5</sub>)

sL = Road surface silt loading, g/m<sup>2</sup>

W = Mean vehicle weight, tons

<sup>4</sup> Incorporates a meteorological adjustment to account for precipitation effects (109.2 days per year averaged over last 10 years) on road dust per AP-42 Section 13.2.1, Equation 2 (1-P/365\*4) = 0.925205479

<sup>5</sup> Brake wear and tire wear emissions estimated from Tables 2-13 and 3-4 from the EPA Technical Report, *Brake and Tire Wear Emissions from On-road Vehicles in MOVES2014 (December 2014)*.