

APPENDIX E  
GENERAL CONFORMITY ANALYSIS FOR EMISSIONS DURING CONSTRUCTION

**Projected Emissions for CY 2015**  
**All Sources**  
**FEMA Valve and Bulkhead Project; Neptune, NJ**

Emission Source	Projected Emissions (tons per year)							CY 2015 (metric tons per year)
	CO	NOx	VOC	PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	CO <sub>2e</sub>	CO <sub>2e</sub>
Construction Equipment Operation	0.40	1.23	0.08	0.07	0.07	0.09	127.71	115.86
Site Preparation - Fugitive Emissions	--	--	--	8.59E-02	8.59E-02	--	--	--
Rock/Soil Transport - Fugitive Emissions	--	--	--	1.14E-03	1.15E-04	--	--	--
<b>Total</b>	<b>0.40</b>	<b>1.23</b>	<b>0.08</b>	<b>0.15</b>	<b>0.15</b>	<b>0.09</b>	<b>127.71</b>	<b>115.86</b>

**Notes:**

1. Assume PM=PM<sub>10</sub>=PM<sub>2.5</sub>

**Valve and Bulkhead Equipment Projected Hours of Operation  
FEMA Valve and Bulkhead Project; Neptune, NJ**

<b>Diesel Equipment</b>		<b>Average Rated HP</b>	<b>No. of Units</b>	<b>CY 2015 Hours</b>
855 Liebherr Crane	Cranes	600	1	186
Dump Truck	Dumpers/Tenders	400	3	6
Excavator 320C L CAT	Excavators	140	1	10
Impact Hammer CAT H160E	Crushing/Processing Equipment	100	1	124
Pickup Truck	Off-Highway Trucks	489	3	180

**Assumptions:**

Excavation of 200 CY of rock/soil and rock/soil transport is predicted to be completed in one construction day.

Construction of the valve/bulkhead project is predicted to be completed in a month's time (31 days).

Pickup Trucks used for small equipment transport across the project site.

Typical workday is assumed to be 10 hours of construction (8:00 am to 7:00 pm), 6 days per week (Monday through Saturday).

Depending on the type of equipment, hours of operation are estimated to be 4, 6, 8 or 10 per day.

Dump trucks would dispose of excavated materials on or very close to the project site.

**Dump Truck Hours estimated as follows:**

Cubic yards of soil and rock transported =	200
Cy/truck/trip hauled =	16
Total trips =	12.5
Average run per trip =	0.5
Total hours operated =	6.25
Total hours/truck =	0.625

**Construction Equipment Air Quality Emission Factors**  
**FEMA Valve and Bulkhead Project; Neptune, NJ**

Diesel Equipment		Average Rated HP <sup>1</sup>	Loading Factors <sup>2</sup>	Emission Factors (lbs/1000 HP-hr) <sup>2</sup>						Emission Factors (lbs/hr) <sup>3</sup>					
				CO	NOx	VOC	PM <sup>4</sup>	SOx	CO <sub>2</sub> e	CO	NOx	VOC	PM <sup>4</sup>	SOx	CO <sub>2</sub> e
855 Liebherr Crane	Cranes	600	43%	3.02	12.06	0.84	0.64	0.82	1186	7.79E-01	3.11E+00	2.17E-01	1.65E-01	2.12E-01	305.95
Dump Truck	Dumpers/Tenders	400	21%	18.74	16.43	5.01	3.11	1.04	1513	1.57E+00	1.38E+00	4.21E-01	2.61E-01	8.74E-02	127.08
Impact Hammer H160E CAT	Crushing/Processing Equipme	100	43%	4.21	12.72	0.99	0.79	0.84	1213	1.81E-01	5.47E-01	4.26E-02	3.40E-02	3.61E-02	52.16
Excavator 320C L CAT	Excavators	140	59%	3.75	10.03	0.75	0.71	0.84	1204	3.10E-01	8.28E-01	6.20E-02	5.86E-02	6.94E-02	99.43
Pickup Truck	Off-Highway Trucks	489	59%	3.66	11.27	0.64	0.57	0.82	1192	1.06E+00	3.25E+00	1.85E-01	1.64E-01	2.37E-01	344.04

1. Average horsepower ratings were obtained from a review of various manufacturers' specifications.
2. Loading factors and emission factors from USAFCEE Air Emissions Guide For Air Force Mobile Sources, August 2013, Section 4.
3. Emission Factors (lbs/hr) = (Average Rated HP X Loading Factors X Emission Factors (lbs/1000 HP-hr)) / 1000
4. PM=PM<sub>10</sub>=PM<sub>2.5</sub>

**Projected Emissions for CY 2015  
Construction Equipment  
FEMA Valve and Bulkhead Project; Neptune, NJ**

Construction Equipment	Usage (hrs)	Emissions (lbs)					
		CO	NOx	VOC	PM <sub>10</sub>	SO <sub>2</sub>	CO <sub>2e</sub>
855 Liebherr Crane	186	144.92	578.74	40.31	30.71	39.35	56,907.29
Dump Truck	6	49.19	43.13	13.15	8.16	2.73	3,971.27
Impact Hammer H160E CAT	124	26.94	81.39	6.33	5.05	5.37	7,761.26
Excavator 320C L CAT	10	3.10	8.28	0.62	0.59	0.69	994.33
Pickup Truck	180	570.21	1,755.81	99.71	88.80	127.75	185,782.90
<b>Total Emissions</b>	<b>(lb/yr):</b>	<b>794.4</b>	<b>2,467.4</b>	<b>160.1</b>	<b>133.3</b>	<b>175.9</b>	<b>255,417.0</b>
<b>Total Emissions</b>	<b>(tpy)</b>	<b>0.40</b>	<b>1.23</b>	<b>0.08</b>	<b>0.07</b>	<b>0.09</b>	<b>127.71</b>
<b>Total Emissions</b>	<b>(Metric Tons/yr)</b>						<b>115.86</b>

**Source:** Emission factors and methodology from USAFCEE Air Emissions Guide For Air Force Mobile Sources (Section 4, August 2013).

**Notes:**

1. Assume PM= PM10=PM2.5

**Fugitive Dust Emissions (Site Preparation)  
FEMA Valve and Bulkhead Project; Neptune, NJ**

**CY 2015**

**Description:<sup>1</sup>**

Square feet:	143,560
Total acres of land disturbed:	2.148
Assumed number of 10-hr days:	35
Assumed equivalent acres/day:	0.061

**Equation for Fugitive Dust Emissions (PM<sub>10</sub>)**

$$E_{TSP} (\text{lb/yr}) = 80 * \text{No. of 8-hr days} * \text{Acres/day}$$

**Calculation**

$$E_{TSP} (\text{lb/yr}) = 80 * 35 \text{ days} * 0.047 \text{ acres/day}$$

$$E_{TSP} = \begin{array}{r} 171.83 \text{ lb/yr} \\ 8.59\text{E-}02 \text{ tpy} \end{array}$$

**Assumptions:**

<sup>1</sup> The construction site is a linear shoreline section and the surrounding area. The area of disturbance is conservatively assumed to be a one-acre staging area plus 50 percent of the project area (2,000 linear feet by 50 feet in width).

**Source of Equation:**

Emission factors and methodology from USAFCEE Air Emissions Guide For Air Force Mobile Sources (Section 4, August 2013).

**Note:** Assume PM= PM<sub>10</sub>=PM<sub>2.5</sub>

## Fugitive Dust Emissions (Rock/Soil Transport) FEMA Valve and Bulkhead Project; Neptune, NJ

### Input Parameters:

Soil moved during excavation =	200	cy	
Soil moved during excavation =	324	tons	(1.62 tons/cy)
Mean wind speed =	9.9	mph	(Atlantic City, NJ; Source: NOAA)
Material moisture content =	12	(Mean, Table 13.2.4, Page 13.2.4-2)	

### Emissions from loading/unloading excavated rock/soil into dump trucks (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k (0.0032) [U/5]^{1.3} / (M/2)^{1.4}$	<b>0.0005 lbs/ton</b>	<b>PM</b>
	<b>0.0002 lbs/ton</b>	<b>PM<sub>10</sub></b>
	<b>0.00003 lbs/ton</b>	<b>PM<sub>2.5</sub></b>

where:

EF = emission factor, lbs/ton

k = particle size multiplier (dimensionless) = 0.74

U = mean wind speed, miles/hr (mph) = 9.9 mph

M = material moisture content (%) = 12%

**Therefore, total emissions from loading/unloading excavated rock/soil from dump trucks =**

EF * tons/yr of rock/soil loading/unloading				
0.15 lbs/yr	<b>0.000</b>	<b>tons/yr</b>	<b>PM</b>	<b>E1</b>
0.07 lbs/yr	<b>0.000</b>	<b>tons/yr</b>	<b>PM<sub>10</sub></b>	<b>E1</b>
0.01 lbs/yr	<b>0.0000</b>	<b>tons/yr</b>	<b>PM<sub>2.5</sub></b>	<b>E1</b>

### Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006)

$EF = [k(s/12)^a (W/3)^b] [(365-p)/365]$	<b>6.52 lbs/VMT/truck</b>	<b>PM</b>
	<b>1.76 lbs/VMT/truck</b>	<b>PM<sub>10</sub></b>
	<b>0.18 lbs/VMT/truck</b>	<b>PM<sub>2.5</sub></b>

where:

k = particle size multiplier = 4.9 lb/VMT (PM), 1.5 lb/VMT (PM10) and 0.15 lb/VMT (PM2.5)

s = material silt content (%) = 6.4%

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM<sub>10</sub> and 0.9 for PM<sub>2.5</sub> (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM<sub>10</sub> and PM<sub>2.5</sub> (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (200 cy/year of excavated soil)/(truck load)\*(average distance travelled each way)

VMT = ((200 cy/yr) / (16 cy/truck))\*1 miles/round trip

VMT = 12.5 VMT/yr

**Therefore, total emissions from driving dump trucks on unpaved roads =**

EF *VMT			
81 lbs/yr	<b>4.07E-02</b>	<b>tons/yr</b>	<b>PM</b>
22 lbs/yr	<b>1.10E-02</b>	<b>tons/yr</b>	<b>PM<sub>10</sub></b>
2 lbs/yr	<b>1.10E-03</b>	<b>tons/yr</b>	<b>PM<sub>2.5</sub></b>

**Fugitive Dust Emissions (Continued)**  
**FEMA Valve and Bulkhead Project; Neptune, NJ**

Assume fugitive dust from unpaved roads is controlled using water sprays.

Assume 90% control efficiency from water spray

**Therefore, actual controlled emissions from driving dump trucks on unpaved roads =**

uncontrolled emissions \* 0.1

<b>4.07E-03 tons/yr</b>	<b>PM</b>	<b>E2</b>
<b>1.10E-03 tons/yr</b>	<b>PM<sub>10</sub></b>	<b>E2</b>
<b>1.10E-04 tons/yr</b>	<b>PM<sub>2.5</sub></b>	<b>E2</b>

**Total annual fugitive emissions from soil removal (tons/yr) =**

<b>4.149E-03 tons/yr</b>	<b>PM</b>
<b>1.136E-03 tons/yr</b>	<b>PM<sub>10</sub></b>
<b>1.154E-04 tons/yr</b>	<b>PM<sub>2.5</sub></b>