APPENDIX 8.1F

Construction and Demolition Emissions and Impact Analysis

APPENDIX 8.1F

CONSTRUCTION AND DEMOLITION EMISSIONS AND IMPACT ANALYSIS

8.1F.1 Onsite Construction

The initial construction of the project is expected to last approximately 32 months, including 4 months of limited demolition activity and 28 months of project construction. Once the new CTGs/HRSGs have successfully commenced operation, the existing SBPP will be demolished over a period of approximately 25 months. Construction and demolition activities will occur in the following main phases:

- Limited demolition in the old LNG facility area;
- Site preparation;
- Foundation work;
- Installation of major equipment;
- Construction/installation of major structures;
- Construction of the SDG&E substation; and
- Demolition of existing power plant.

8.1F.1.1 Construction Activities

The initial limited demolition of foundations and berms in the old LNG facility area is expected to take about 4 months. This initial site clearing will be followed by site preparation activities, which include grading, excavation of footings and foundations, and backfilling operations. After site preparation is finished, the construction of the foundations and structures is expected to begin. Once the foundations and structures are finished, installation and assembly of the mechanical and electrical equipment are scheduled to commence.

Fugitive dust emissions from the construction of the project will result from:

- Dust entrained during site preparation and grading/excavation at the construction site;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction will result from:

- Exhaust from the Diesel construction equipment used for site preparation, grading, excavation, trenching and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from Diesel-powered welding machines;
- Exhaust from pickup trucks and Diesel trucks used to transport workers and materials around the construction site;

- Exhaust from Diesel trucks used to deliver concrete, fuel, and construction supplies to the construction site; and
- Exhaust from automobiles used by workers to commute to the construction site.

To determine the potential worst-case daily construction impacts, exhaust and dust emission rates have been evaluated for each source of emissions. Maximum short-term impacts are calculated based on the equipment mix expected during Month 12 of the construction schedule. Annual emissions are based on the average equipment mix during the peak 12-month period out of the overall 32-month construction period.

8.1F.1.2 Demolition Activities

Demolition of the existing SBPP will occur over a 25-month period following the commissioning of the new SBRP facility. Demolition activities will generate combustion and fugitive dust emissions similar to those described above for construction activities. Based on a review of the equipment expected during the demolition phase, emissions during this phase are expected to be lower than emissions during the construction phase. Because emissions during the demolition phase are expected to be lower than emissions during the construction phase, demolition emissions are not evaluated further.

8.1F.2 Linear Facilities

The linear facilities that were constructed for the existing SBRP project have adequate capacity to supply process water, natural gas fuel and potable water for the SBPP project. No additional linear facilities will be constructed as a result of the proposed project.

8.1F.3 Available Mitigation Measures

The following typical mitigation measures are proposed to control exhaust emissions from the Diesel heavy equipment and potential emissions of fugitive dust during construction of the project:

- Unpaved roads and disturbed areas in the project construction site will be watered as frequently as necessary to prevent fugitive dust plumes. The frequency of watering can be reduced or eliminated during periods of precipitation.
- The vehicle speed limit will be 15 miles per hour within the construction site.
- The construction site entrances shall be posted with visible speed limit signs.
- Construction equipment vehicle tires will be inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.
- Gravel ramps of at least 20 feet in length will be provided at the tire washing/cleaning station.
- Unpaved exits from the construction site will be graveled or treated to prevent track-out to public roadways.
- Construction vehicles will enter the construction site through the treated entrance roadways, unless an alternative route has been submitted to and approved by the Compliance Project Manager.

- Construction areas adjacent to any paved roadway will be provided with sandbags or other measures as specified in the Storm Water Pollution Prevention Plan (SWPPP) to prevent run-off to roadways.
- Paved roads within the construction site will be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs to prevent the accumulation of dirt and debris.
- At least the first 500 feet of any public roadway exiting from the construction site shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff from the construction site is visible on public roadways.
- Soil storage piles and disturbed areas that remain inactive for longer than 10 days will be covered or treated with appropriate dust suppressant compounds.
- Vehicles used to transport solid bulk material on public roadways and having the potential to cause visible emissions will be provided with a cover, or the materials will be sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.
- Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) will be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition shall remain in place until the soil is stabilized or permanently covered with vegetation.

An on-site Air Quality Construction Mitigation Manager will be responsible for directing and documenting compliance with construction-related mitigation conditions.

8.1F.4 Estimates of Emissions with Mitigation Measures

8.1F.4.1 Onsite Construction

Tables 8.1F-1 and 8.1F-2 show the estimated maximum daily and annual heavy equipment exhaust and fugitive dust emissions with recommended mitigation measures for onsite construction activities. Detailed emission calculations are included as Attachment 8.1F-1.

Table 8.1F-1

Maximum Daily Emissions During Construction, Pounds Per Day

	NOx	CO	VOC	SOx	PM_{10}	$PM_{2.5}$
Onsite						
Construction Equipment	149.1	321.6	26.6	0.2	4.4	4.4
Fugitive Dust	--	--	--	--	26.5	6.7
Offsite						
Worker Travel, Truck Deliveries[a]	64.0	189.1	18.9	0.2	1.6	1.6
Total Emissions						
Total	213.1	510.7	45.5	0.4	32.5	12.7

[a] Offsite emissions.

Table 8.1F-2

Peak Annual Emissions During Project Construction, Tons Per Year

	NOx	CO	VOC	SOx	PM_{10}	$PM_{2.5}$
Onsite						
Construction Equipment	15.7	29.5	2.6	0.0	0.5	0.5
Fugitive Dust	--	--	--	--	2.5	0.6
Offsite						
Worker Travel, Truck Deliveries [a]	8.8	30.0	3.0	0.0	0.2	0.2
Total Emissions						
Total	24.5	59.5	5.6	0.1	3.2	1.3

[a] Offsite emissions.

8.1F.5 Analysis of Ambient Impacts from Onsite Construction

Ambient air quality impacts from emissions during construction of the project were estimated using an air quality dispersion modeling analysis. The modeling analysis considers the construction site location, the surrounding topography, and the sources of emissions during construction, including vehicle and equipment exhaust emissions and fugitive dust.

8.1F.5.1 Existing Ambient Levels

As with the modeling analysis of project operating impacts (Section 8.1.5), ambient monitoring data from Chula Vista was used to establish the ambient background levels for the construction impact modeling analysis. Table 8.1F-3 shows the maximum concentrations of NOx, SO_2, CO, and PM_{10} recorded for 2003 through 2005 in Chula Vista.

Table 8.1F-3

Maximum Background Concentrations, 2003-2005 (µg/m^3)

Pollutant	Averaging Time	2003	2004	2005
NO_2	1-hour	192.0	135.3	133.6
	Annual	33.9	0.1	30.1
SO_2	1-hour	78.6	110.0	41.9
	3-hour	55.0	55.0	23.6
	24-hour	28.8	41.9	13.1
	Annual	10.5	7.9	7.9
CO	1-hour	8,625	4,875	3,500
	8-hour	3,778	2,778	2,333
PM_{10}	24-hour	78	45	52
	Annual	27.6	26.5	27.0
$PM_{2.5}$	24-hour[a]	39.2 [b]	30.7	30.2
	Annual	14.4	12.2	11.8

a. $PM_{2.5}$ 24-hr average concentrations shown are 98th percentile values rather than highest values because compliance with the standard is based on 98th percentile readings.

b. As discussed in Section 8.1.3.6, Table 8.1-7, a concentration of 239 µg/m^3 was recorded at the Chula Vista monitoring station during the firestorms of October 2003. This value is considered anomalous, and hence, the District's reported value of 39.2 µg/m^3 is used to represent the background 24-hour concentration of $PM_{2.5}$.

8.1F.5.2 Dispersion Model

The EPA-approved Industrial Source Complex Short Term (ISCST) model was used to estimate ambient impacts from construction activities.

The emission sources for the construction site were grouped into three categories: exhaust emissions, construction dust emissions and windblown dust emissions. The exhaust and construction dust emissions were modeled as volume sources. The windblown dust emissions were modeled as area sources. For the volume sources, the vertical dimension was set to 6 meters. For combustion sources in the project site area, the horizontal dimension was set to 243.1 meters, with sigma-y = 56.53 meters (based on the width of the construction area).

For the windblown dust sources, the area covers the active construction area. An effective plume height of 0.5 meters was used in the modeling analysis. The construction impacts modeling analysis receptor set excluded the areas under the applicant's control, including the existing SBPP property and the demolition and laydown areas.

To determine the construction impacts on short-term ambient standards (24 hours and less), the worst-case daily onsite construction emission levels shown in Table 8.1F-1 were used. For pollutants with annual average ambient standards, the annual onsite emission levels shown in Table 8.1F-2 were used. As with the health risk assessment, the meteorological data used for the construction emission impacts analysis is the five-year dataset from San Diego Lindbergh Field.

F-4.5.3 Modeling Results

Based on the emission rates of NOx, SO_2, CO, and PM_{10} and the meteorological data, the ISCST model calculates hourly and annual ambient impacts for each pollutant. As mentioned above, the modeled 1-hour, 3-hour, 8-hour, and 24-hour ambient impacts are based on the worst-case daily emission rates of NOx, SO_2, CO, and PM_{10}. The annual impacts are based on the annual emission rates of these pollutants.

The one-hour and annual average concentrations of NO_2 were computed following the revised EPA guidance for computing these concentrations (August 9, 1995 *Federal Register*, 60 FR 40465). The ISCST_OLM model was used for the one-hour average NO_2 impacts; uncorrected one-hour impacts are also reported for comparison. The annual average was calculated using the ambient ratio method (ARM) with the national default value of 0.75 for the annual average NO_2/NOx ratio.

The modeling analysis results are shown in Table 8.1F-4. Also included in the table are the maximum background levels that have occurred in the last 3 years and the resulting total ambient impacts. Construction impacts alone for all modeled pollutants are expected to be below the most stringent state and national standards. With the exception of the 24-hour and annual average PM_{10} and annual average $PM_{2.5}$, construction activities are not expected to cause an exceedance of state or federal ambient air quality standards. However, the state 24-hour and annual PM_{10} standards and state annual $PM_{2.5}$ standard are exceeded in the absence of the construction emissions for the project.

The dust mitigation measures already proposed by the applicant are expected to be effective in minimizing fugitive dust emissions. The attached isopleth diagrams show the extent of the modeled impacts from construction PM_{10} and $PM_{2.5}$ for the 24-hour and annual averaging periods. The attached isopleth diagrams also show 1-hour average NO_2 modeled impacts.

Table 8.1F-4

Modeled Maximum Onsite Construction Impacts

Pollutant	Averaging Time	Maximum Impacts (µg/m³)	Background (µg/m³)	Total Impact (µg/m³)	State Standard (µg/m³)	Federal Standard (µg/m³)
NO_2[a]	1-hour	249	192	441	470	--
	Annual	17.6	33.9	52	--	100
SO_2	1-hour	1.0	110	111	650	--
	3-hour	0.5	55.0	56	--	1300
	24-hour	0.2	41.9	42	109	365
	Annual	0.03	10.5	11	--	80
CO	1-hour	1,585	8,625	10,210	23,000	40,000
	8-hour	593	3,778	4,371	10,000	10,000
PM_{10}[b]	24-hour	29.9	78	108	50	150
	Annual	4.7	27.6	32	20	50
$PM_{2.5}$[b]	24-hour	10.9	39.2	50	--	65
	Annual	1.8	14.4	16	12	15

Notes:

a. Ozone limiting method applied for 1-hour average, using concurrent O_3 data (1990). ARM applied for annual average, using national default 0.75 ratio.

b. PM_{10} and $PM_{2.5}$ impacts shown are from fugitive dust as well as combustion sources. 24-hour average $PM_{2.5}/PM_{10}$ impact from combustion sources only is 4.0 µg/m³; annual average impact from combustion sources is 0.7 µg/m³.

As shown on these isopleth diagrams, maximum impacts occur on the project site fenceline, and concentrations decrease rapidly within a couple of hundred meters of the project site. For example, maximum modeled 24-hour average PM_{10} impacts along the fenceline are approximately 30 µg/m³. However, impacts are reduced by half within 200 meters of the facility fenceline.

It is also important to note that emissions in an exhaust plume are dispersed through the entrainment of ambient air, which dilutes the concentration of the emissions as they are carried away from the source by winds. The process of mixing the pollutants with greater and greater volumes of cleaner air is controlled primarily by the turbulence in the atmosphere. This dispersion occurs both horizontally, as the exhaust plume rises above the emission point, and vertically, as winds carry the plume horizontally away from its source.

The rise of a plume above its initial point of release is a significant contributing factor to the reductions in ground-level concentrations, both because a rising plume entrains more ambient air as it travels downwind, and because it travels farther downwind (and thus also undergoes more horizontal dispersion) before it impacts the ground. Vertical plume rise occurs as a result of buoyancy (plume is hotter than ambient air, and hot air, being less dense, tends to rise) and/or momentum (plume has an initial vertical velocity).

InISCST3, area sources are not considered to have either buoyant or momentum plume rise, and therefore the model assumes that there is no vertical dispersion taking place. Thus a significant source of plume dilution is ignored when sources are modeled as area sources. The project construction site impacts are not unusual in comparison to most construction project analyses. Construction sites that use good dust suppression techniques and low-emitting vehicles typically do not cause exceedances of air quality standards. The input and output modeling files are being provided electronically.

F-5.4 Health Risk of Diesel Exhaust

The combustion portion of annual PM_{10} emissions from Table 8.1F-3 above was modeled separately to determine the annual average Diesel PM_{10} exhaust concentration. This was used with HARP-derived risk values for Diesel exhaust particulate[8] for a 70-year lifetime to determine the potential carcinogenic risk from Diesel exhaust during construction. The exposure was also adjusted by a factor of 32/840, or 0.0381, to adjust a 70-year (840 month) lifetime to the 32-month construction exposure period.

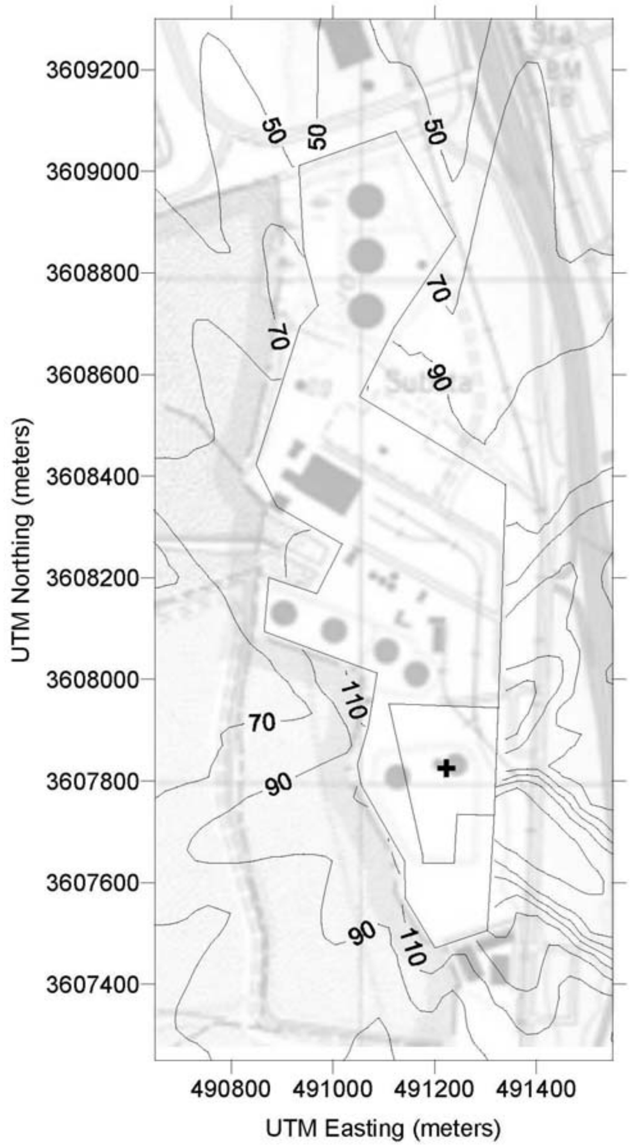
The maximum modeled annual average concentration of Diesel exhaust PM_{10} at any location is 0.73 $\mu g/m^3$. The risk values obtained from HARP range from $2.86x10^{-4}$ (average point estimate value) to $4.15x10^{-4}$ (derived OEHHA and high end risk estimates). Using the range of risk values and adjustment factors described above, the carcinogenic risk due to exposure to Diesel exhaust during construction activities is expected to be between approximately 8 and 12 in one million. These risk estimates are conservatively overstated, in that not all of the construction equipment modeled is expected to be operating at the same time for extended periods. In addition, mitigation required by the CEC is expected to reduce these impacts to a less-than-significant level.

It is also important to note that these impacts are highly localized near the project site. As shown in the attached annual average Diesel combustion PM_{10} isopleth diagram (Figure 8.1F-3), the area in which the risk may exceed 1 in one million (Diesel PM_{10} impact greater than or equal to 0.063 $\mu g/m^3$) barely extends beyond the facility fenceline. This analysis remains conservative because, as discussed above, the modeled PM_{10} concentrations from construction operations are overpredicted by the ISCST3 model.

[8] See Appendix 8.1E for a discussion of the use of the HARP model to derive cancer risk values.

Figure 8.1F-1

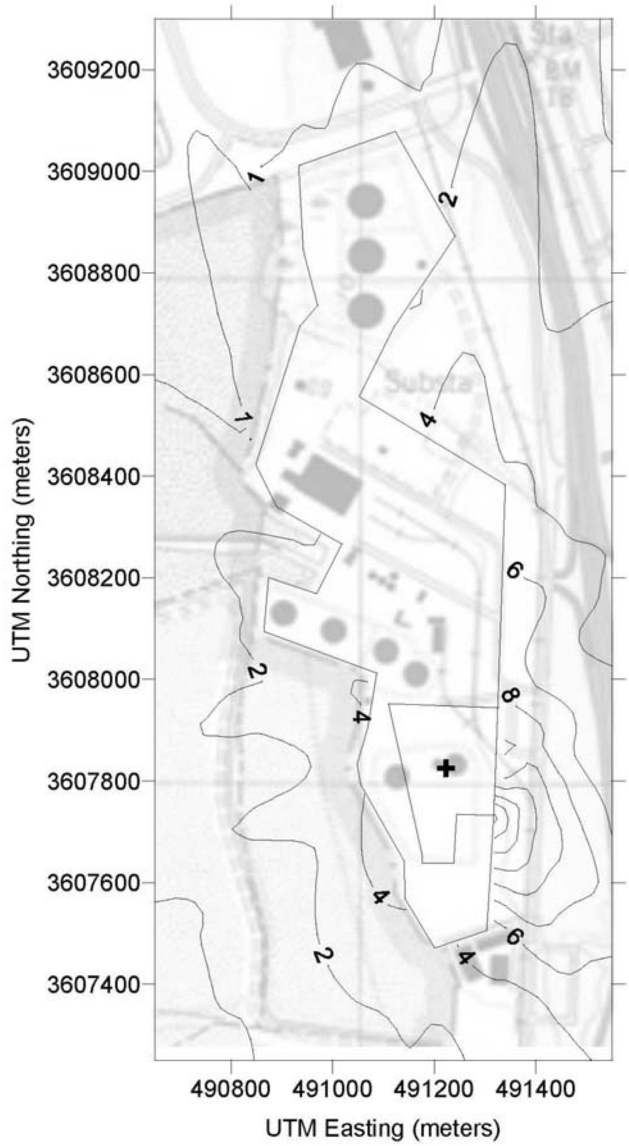
Maximum One-Hour Average NO2 Impacts During Construction Activities (Ozone-Limited)



Note: Concentrations are shown in μg/m³.

Figure 8.1F-2

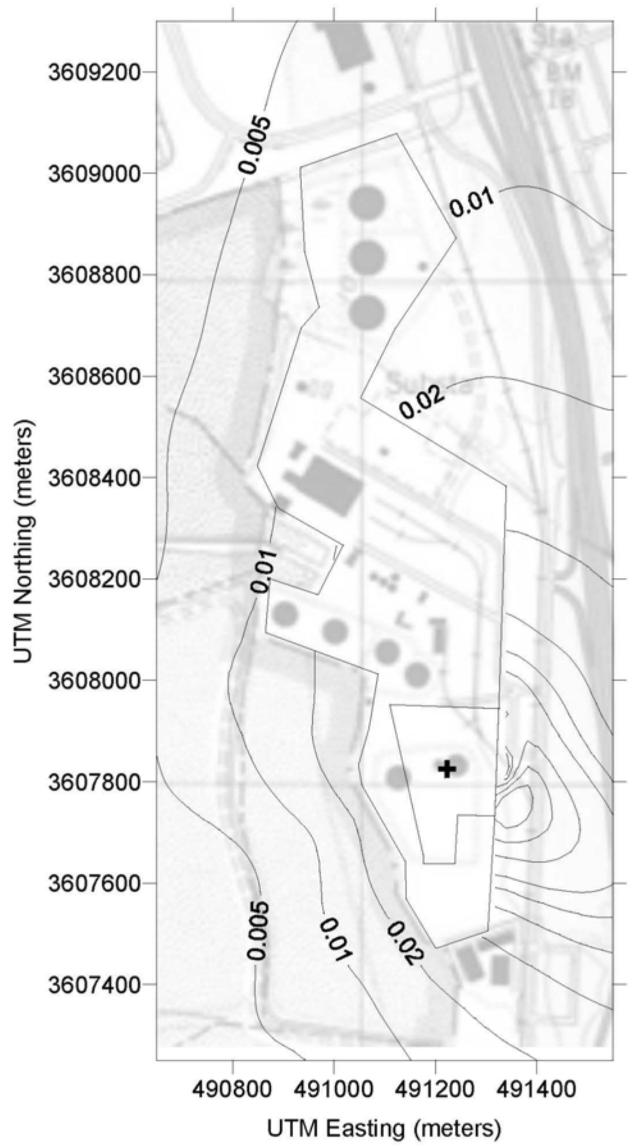
Maximum 24-Hour Average PM10 Impacts During Construction Activities, All Sources



Note: Concentrations are shown in μg/m^3.

Figure 8.1F-3

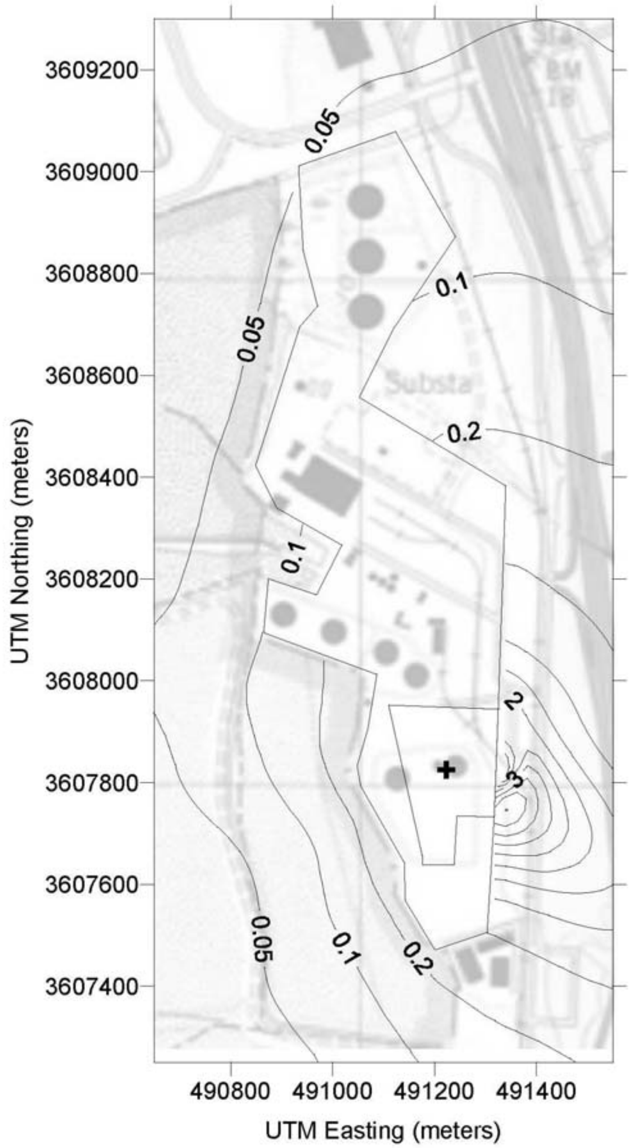
Maximum Annual Average PM10/PM2.5 Impacts During Construction Activities, Combustion Sources



Note: Concentrations are shown in μg/m^3.

Figure 8.1F-4

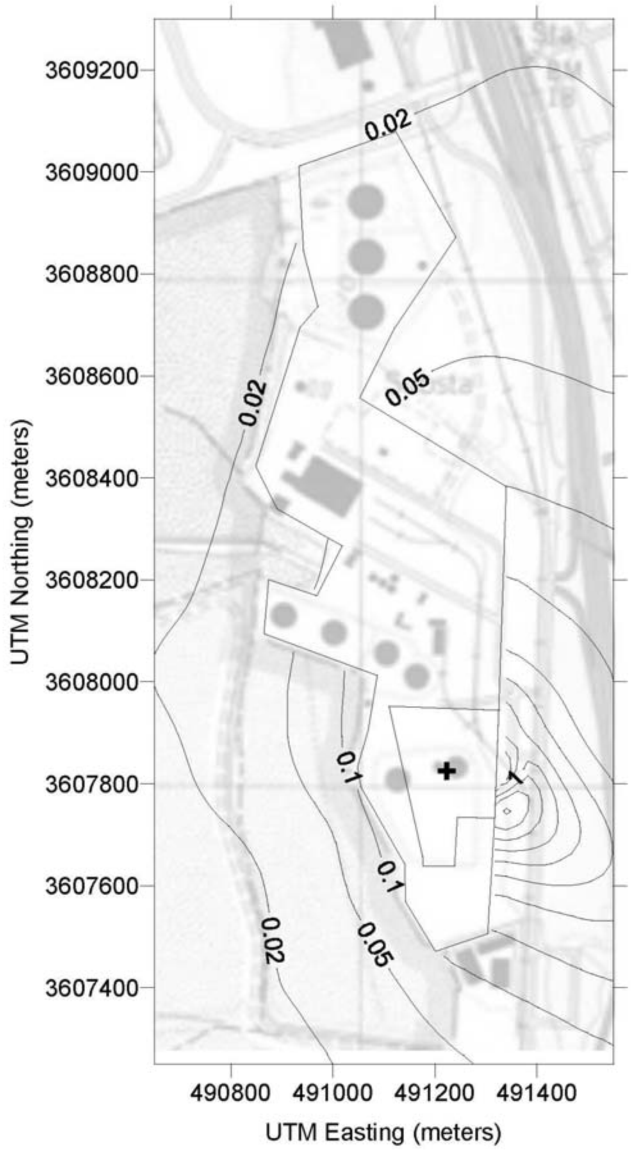
Maximum Annual Average PM10 Impacts During Construction Activities, All Sources



Note: Concentrations are shown in μg/m^3.

Figure 8.1F-5

Maximum Annual Average PM2.5 Impacts During Construction Activities, All Sources



Note: Concentrations are shown in μg/m³.

Attachment 8.1F-1

Detailed Construction Emissions Calculations

SBRP CONSTRUCTION EMISSION CALCULATIONS

Table 8.1F-1 Daily and Annual Construction Emissions

Daily Construction Emissions (peak month) (lbs/day)						
	NOx	CO	VOC	SOx	PM2.5	PM10
Onsite						
Construction Equipment	149.14	321.63	26.57	0.19	4.41	4.41
Fugitive Dust					6.74	26.47
Subtotal =	149.14	321.63	26.57	0.19	11.15	30.88
Offsite						
Worker Travel	17.37	179.27	16.78	0.14	0.55	0.55
Truck Deliveries	46.62	9.80	2.12	0.07	1.06	1.06
Subtotal =	63.99	189.06	18.90	0.21	1.61	1.61
Total =	213.13	510.70	45.47	0.39	12.76	32.49

Peak Annual Construction Emissions (12-month period) (tons/yr)						
	NOx	CO	VOC	SOx	PM2.5	PM10
Onsite						
Construction Equipment	15.68	29.49	2.55	0.02	0.49	0.49
Fugitive Dust					0.63	2.46
Subtotal =	15.68	29.49	2.55	0.02	1.12	2.94
Offsite						
Worker Travel	2.78	28.73	2.69	0.02	0.09	0.09
Truck Deliveries	6.01	1.26	0.27	0.01	0.14	0.14
Subtotal =	8.80	29.99	2.96	0.03	0.22	0.22
Total =	24.47	59.48	5.52	0.05	1.34	3.17

Table 8.1F-2 Daily and Annual Dust Emissions

Daily Fugitive Dust Emissions (peak month)										
Equipment	Number of Units	Daily Process Rate Per Unit	Total Process Rate	Units	PM2.5 Emission Factor(1) (lbs/unit)	PM10 Emission Factor(1) (lbs/unit)	Control Factor(1) (%)	PM2.5 Emissions (lbs/day)	PM10 Emissions (lbs/day)
Excavator/Backhoe	2	504.0	1,008.0	tons	5.305E-05	0.0015	0%	0.05	1.52
Truck, Flatbed, Ford - Unpaved Road Travel	3	2.2	6.7	vmt	0.22	1.4328	92%	0.13	0.82
Dozer	2	8.0	16.0	hr	0.23	0.4194	0%	3.69	6.71
Truck, Concrete Pump - Unpaved Road Travel	2	9.0	17.9	vmt	0.46	2.9806	92%	0.69	4.53
Excavator/Loader, Cat 936 F	1	588.0	588.0	tons	3.616E-05	0.0001	0%	0.02	0.07
Excavator/Loader, Cat 938 F	1	588.0	588.0	tons	3.616E-05	0.0001	0%	0.02	0.07
Truck, Water - Unpaved Road Travel	1	13.4	13.4	vmt	0.44	2.8400	92%	0.50	3.24
Truck, Fuel/Lube - Unpaved Road Travel	3	6.7	20.2	vmt	0.33	2.1349	92%	0.56	3.65
Truck, Articulating - Unpaved Road Travel	1	16.5	16.5	vmt	0.46	2.9806	92%	0.64	4.16
Truck, Articulating - Unloading	1	1,176.0	1,176.0	tons	3.616E-05	0.0001	0%	0.04	0.14
Excavator/Mtr Grdr	1	13.4	13.4	vmt	0.02	0.2754	92%	0.02	0.31
Windblown Dust (active construction area)	N/A	500,303.0	500,303.0	sq.ft.	6.728E-06	1.682E-05	92%	0.29	0.71
Delivery Truck Unpaved Road Travel	13.1	0.2	2.7	vmt	0.35	2.3088	92%	0.08	0.53
Total =								6.74	26.47

Notes:
(1) See notes for fugitive dust emission calculations.

Peak Annual Fugitive Dust Emissions					
Activity	Average Daily PM2.5 Emissions(1) (lbs/day)	Average Daily PM10 Emissions(1) (lbs/day)	Days per Year	Annual PM2.5 Emissions (tons/yr)	Annual PM10 Emissions (tons/yr)
Construction Activities	4.92	19.64	240	0.59	2.36
Windblown Dust	0.22	0.54	365	0.04	0.10
Total =				0.63	2.46

Notes:
(1) Based on average of daily emissions during peak 12-month construction period.

Table 8.1F-3 Onsite Combustion Emissions

			Base Factors g/bhp, if Tier 1 >50 hp (1)						Appendix A Table A3 Adjustment (2)						Adjustment (3)	Adjusted Factors (g/bhp)					
Equipment	HP Cat.	Tier	BSFC lb/h	NOx	CO	VOC	SOx	PM10	Adj. Type	NOx	CO	VOC	SOx	PM10	PM10 Fuel S	BSFC	NOx	CO	VOC	SOx	PM10
Air Compressor, Ingersoll Rand, 185 cfm	16-25	2	0.408	4.4399	2.1610	0.438	0.00555	0.2665	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.22	3.31	0.46	0.0055	0.23
Asphalt Paver, Cat AP-800B, 102 hp	100-175	2	0.367	4.1000	0.8667	0.3384	0.00499	0.18	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Compactors, Cat CS-563, 145 hp	100-175	2	0.367	4.1000	0.8667	0.3384	0.00499	0.18	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Portable Compression Eq., Multiquip, Jumping Jack, MRT-80L, 3.3 hp	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Portable Compression Eq., Multiquip, Plate Compactor, MVC-62H, 4.6 hp	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Concrete Vibrator, North Rock, Flex Shaft Vibrator, 15A	Electric	na	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric
Light Tower, Magnum, Nightbuster 5000, 15.5 hp	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Dozer, Cat D8U, 285 hp	175-300	2	0.367	4.0000	0.7475	0.3085	0.00499	0.1316	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.80	1.14	0.32	0.0049	0.08
Excavator/Backhoe, Cat 312, 84 hp	50-100	2	0.408	4.7000	2.3655	0.3672	0.00555	0.2400	LoLF	1.10	2.57	2.29	1.18	1.97	-0.113	0.481	5.17	6.08	0.84	0.0064	0.36
Excavator/Loader, Cat 936 F, 200 hp	175-300	2	0.367	4.0000	0.7475	0.3085	0.00499	0.1316	LoLF	1.10	2.57	2.29	1.18	1.97	-0.101	0.433	4.40	1.92	0.71	0.0057	0.16
Excavator/Loader, Cat 938 F, 140 hp	100-175	2	0.367	4.1000	0.8667	0.3384	0.00499	0.18	LoLF	1.10	2.57	2.29	1.18	1.97	-0.101	0.433	4.51	2.23	0.77	0.0057	0.25
Excavator/Mtr Grdr, Cat 140 G, 165 hp	100-175	2	0.367	4.1000	0.8667	0.3384	0.00499	0.18	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.087	0.371	3.90	1.33	0.36	0.0049	0.13
Crane, 225 Ton, Manitowoc, 350 hp	300-600	2	0.367	4.3351	0.8425	0.1669	0.00499	0.1316	None	1.00	1.00	1.00	1.00	1.00	-0.086	0.367	4.34	0.84	0.17	0.0049	0.05
Crane, 150 Ton, Manitowoc, 250 hp	175-300	2	0.367	4.0000	0.7475	0.3085	0.00499	0.1316	None	1.00	1.00	1.00	1.00	1.00	-0.086	0.367	4.00	0.75	0.31	0.0049	0.05
Crane, 40 Ton, Grove RT700B, 185 hp	175-300	2	0.367	4.0000	0.7475	0.3085	0.00499	0.1316	None	1.00	1.00	1.00	1.00	1.00	-0.086	0.367	4.00	0.75	0.31	0.0049	0.05
Crane, 20 Ton, Grove RT400, 185 hp	175-300	2	0.367	4.0000	0.7475	0.3085	0.00499	0.1316	None	1.00	1.00	1.00	1.00	1.00	-0.086	0.367	4.00	0.75	0.31	0.0049	0.05
Welder, Multiquip GA 3600, 7.5 hp	Gasoline	na	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Welder, Multiquip BLW-300SS, 23 hp	16-25	2	0.408	4.4399	2.1610	0.438	0.00555	0.2665	Hi LF	0.95	1.53	1.05	1.01	1.23	-0.096	0.412	4.22	3.31	0.46	0.0055	0.23
Truck, Water, International, 300 hp	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Truck, Fuel/Lube, International, 210 hp	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Truck, Articulating, Cat D200, 180 hp	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Truck, Flatbed, Ford, 180 hp	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Truck, Concrete Pump, International, 190 hp	Onroad	na	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad	Onroad
Radio, Hand Held	Electric	na	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric	Electric

	Adjusted factors lbs/1000 gallon (4)						Total Daily Fuel Use(5) (Gals/day)	Daily Emissions Lbs/day					Total Annual Peak Fuel Use(6) (Gals/yr)	Annual Emissions Lbs/yr					Total Annual Average Fuel Use(7) (Gals/yr)	Annual Emissions Lbs/yr				
Equipment	Tier	NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10		NOx	CO	VOC	SOx	PM10
Air Compressor, Ingersoll Rand, 185 cfm	2	160.21	125.59	17.47	0.21	8.79	81.28	13.02	10.21	1.42	0.02	0.71	18,288	2929.99	2296.76	319.47	3.80	160.74	10,363	1660.33	1301.50	181.03	2.15	91.08
Asphalt Paver, Cat AP-800B, 102 hp	2	164.48	56.00	15.00	0.21	5.69	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	5,400	888.18	302.38	81.02	1.12	30.71
Compactors, Cat CS-563, 145 hp	2	164.48	56.00	15.00	0.21	5.69	24.50	4.03	1.37	0.37	0.01	0.14	5,880	967.13	329.26	88.23	1.22	33.44	5,460	898.04	305.74	81.92	1.13	31.05
Portable Compression Eq., Multiquip, Jumping Jack, MRT-80L, 3.3 hp	Gasoline	195.25	7792.25	408.25	0.00	12.80	3.00	0.59	23.38	1.22	0.00	0.04	630	123.01	4909.12	257.20	0.00	8.06	399	77.82	3105.77	162.72	0.00	5.10
Portable Compression Eq., Multiquip, Plate Compactor, MVC-62H, 4.6 hp	Gasoline	195.25	7792.25	408.25	0.00	12.80	3.00	0.59	23.38	1.22	0.00	0.04	600	117.15	4675.35	244.95	0.00	7.68	360	70.29	2805.21	146.97	0.00	4.61
Concrete Vibrator, North Rock, Flex Shaft Vibrator, 15A	Electric	Electric	Electric	Electric	Electric	Electric	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Light Tower, Magnum, Nightbuster 5000, 15.5 hp	Gasoline	195.25	7792.25	408.25	0.00	12.80	25.40	4.96	197.92	10.37	0.00	0.33	4,064	793.50	31667.70	1659.13	0.00	52.01	3,157	616.38	24599.02	1288.79	0.00	40.40
Dozer, Cat D8U, 285 hp	2	160.47	48.29	13.68	0.21	3.17	136.00	21.82	6.57	1.86	0.03	0.43	23,738	3809.16	1146.43	324.71	4.93	75.33	25,735	4129.64	1242.89	352.02	5.35	81.67
Excavator/Backhoe, Cat 312, 84 hp	2	168.09	197.65	27.34	0.21	11.71	24.00	4.03	4.74	0.66	0.00	0.28	4,800	806.82	948.73	131.23	1.00	56.21	4,320	726.14	853.85	118.10	0.90	50.59
Excavator/Loader, Cat 936 F, 200 hp	2	159.03	69.44	25.53	0.21	5.71	24.00	3.82	1.67	0.61	0.00	0.14	5,760	916.04	399.95	147.08	1.19	32.88	5,349	850.60	371.38	136.57	1.11	30.53
Excavator/Loader, Cat 938 F, 140 hp	2	163.01	80.51	28.01	0.21	9.15	28.00	4.56	2.25	0.78	0.01	0.26	2,240	365.14	180.34	62.74	0.46	20.51	2,160	352.10	173.90	60.50	0.45	19.77
Excavator/Mtr Grdr, Cat 140 G, 165 hp	2	164.48	56.00	15.00	0.21	5.69	32.00	5.26	1.79	0.48	0.01	0.18	1,920	315.80	107.51	28.81	0.40	10.92	3,291	541.36	184.31	49.39	0.68	18.72
Crane, 225 Ton, Manitowoc, 350 hp	2	184.89	35.93	7.12	0.21	1.95	60.00	11.09	2.16	0.43	0.01	0.12	10,800	1996.83	388.07	76.88	2.25	21.07	4,629	855.79	166.32	32.95	0.96	9.03
Crane, 150 Ton, Manitowoc, 250 hp	2	170.60	31.88	13.16	0.21	1.95	40.00	6.82	1.28	0.53	0.01	0.08	7,200	1228.32	229.54	94.73	1.50	14.05	3,086	526.42	98.38	40.60	0.64	6.02
Crane, 40 Ton, Grove RT700B, 185 hp	2	170.60	31.88	13.16	0.21	1.95	64.00	10.92	2.04	0.84	0.01	0.12	14,720	2511.23	469.29	193.68	3.06	28.72	6,857	1169.83	218.61	90.22	1.43	13.38
Crane, 20 Ton, Grove RT400, 185 hp	2	170.60	31.88	13.16	0.21	1.95	128.00	21.84	4.08	1.68	0.03	0.25	26,240	4476.55	836.55	345.25	5.45	51.19	13,166	2246.07	419.73	173.23	2.74	25.69
Welder, Multiquip GA 3600, 7.5 hp	Gasoline	195.25	7792.25	408.25	0.00	12.80	2.00	0.39	15.58	0.82	0.00	0.03	480	93.72	3740.28	195.96	0.00	6.14	274	53.55	2137.30	111.98	0.00	3.51
Welder, Multiquip BLW-300SS, 23 hp	2	160.21	125.59	17.47	0.21	8.79	81.28	13.02	10.21	1.42	0.02	0.71	30,277	4850.77	3802.42	528.90	6.29	266.11	17,591	2818.38	2209.27	307.30	3.65	154.61
Truck, Water, International, 300 hp	Onroad	137.02	28.80	6.22	0.20	3.11	25.04	3.43	0.72	0.16	0.00	0.08	6,010	823.42	173.08	37.40	1.19	18.70	3,863	529.34	111.26	24.04	0.77	12.02
Truck, Fuel/Lube, International, 210 hp	Onroad	137.02	28.80	6.22	0.20	3.11	75.12	10.29	2.16	0.47	0.01	0.23	16,026	2195.77	461.54	99.74	3.18	49.87	8,800	1205.72	253.44	54.77	1.75	27.38
Truck, Articulating, Cat D200, 180 hp	Onroad	35.80	173.92	18.31	0.18	0.78	12.48	0.45	2.17	0.23	0.00	0.01	2,995	107.24	520.94	54.84	0.53	2.33	2,353	84.26	409.31	43.08	0.42	1.83
Truck, Flatbed, Ford, 180 hp	Onroad	35.80	173.92	18.31	0.18	0.78	37.44	1.34	6.51	0.69	0.01	0.03	7,738	277.03	1345.75	141.66	1.37	6.02	3,851	137.87	669.78	70.50	0.68	2.99
Truck, Concrete Pump, International, 190 hp	Onroad	137.02	28.80	6.22	0.20	3.11	50.08	6.86	1.44	0.31	0.01	0.16	12,019	1646.83	346.16	74.80	2.39	37.40	7,083	970.45	203.99	44.08	1.41	22.04
Radio, Hand Held	Electric	Electric	Electric	Electric	Electric	Electric	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
Total =							956.62	149.14	321.63	26.57	0.19	4.36	202,424.18	31,351.43	58,974.77	5,107.37	40.21	959.38	137,546.93	21,408.56	42,143.32	3,651.80	27.33	682.75
														15.68	29.49	2.55	0.02	0.48		10.70	21.07	1.83	0.01	0.34

Table 8.1F-4 Offsite Delivery Truck Emissions

Delivery Truck Daily Emissions (Maximum Monthly)												
Number of Deliveries Per Day(1)	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Day	Emission Factors (lbs/vmt)(1)					Daily Emissions (lbs/day)				
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
13.1	130	1703	0.0274	0.0058	0.0012	0.0000	0.0006	46.62	9.80	2.12	0.07	1.06
Idle exhaust (2)												0.05502

Delivery Truck Peak Annual Emissions												
Number of Deliveries Per Year	Average Round Trip Haul Distance (miles)	Vehicle Miles Traveled Per Year	Emission Factors (lbs/vmt)(1)					Annual Emissions (tons/yr)				
			NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
3379	130	439270.00	0.0274	0.0058	0.0012	0.0000	0.0006	6.01	1.26	0.27	0.01	0.14
Idle exhaust (2,3)												0.0071

Notes:
(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, San Diego County, model years 1965 to 2007.
(2) Peak annual number of trucks per year times 1 hr idle time per visit times 0.0042 lb/hr
(3) Based on 1.91 g/hr idle emission rate for the composite HDD truck fleet in 2001 from EPA's PART5 model.

Table 8.1F-5 Offsite Worker Travel Emissions

Worker Travel Daily Emissions (Maximum Monthly)														
Number of Workers Per Day(1)	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Vehicle Miles Traveled Per Day (Miles)	Emission Factors (lbs/vmt)(1)					Daily Emissions (lbs/day)				
					NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
236	1	236	65	15,340	0.0011	0.0117	0.0011	0.0000	0.0000	17.37	179.27	16.78	0.14	0.55

Worker Travel Peak Annual Emissions															
Average Number of Workers Per Day	Average Vehicle Occupancy (person/veh.)	Number of Round Trips Per Day	Average Round Trip Haul Distance (Miles)	Days per Year	Vehicle Miles Traveled Per Year	Emission Factors (lbs/vmt)(1)					Annual Emissions (tons/yr)				
						NOx	CO	POC	SOx	PM10	NOx	CO	POC	SOx	PM10
315	1	315	65	240	4,916,600	0.0011	0.0117	0.0011	0.0000	0.0000	2.78	28.73	2.69	0.02	0.09

Notes:
(1) Emission factors from delivery trucks and worker travel from EMFAC2002, V2.2, San Diego County, model years 1965 to 2007.

Notes - Fugitive Dust Emission Calculations

Wind erosion of active construction area - 'Source: "Improvement of Specific Emission Factors (BACM Project No. 1), Final Report", prepared for South Coast AQMD by Midwest Research Institute, March 1996

Level 2 Emission Factor =	0.011	ton/acre-month
Construction Schedule =	30	days/month
=	0.7	lbs/acre-day
=	1.682E-05	PM10 lbs/scf-day
	6.7278E-06	PM2.5 lbs/scf-day

Material Unloading - Source: AP-42, p. 13.2.4-3, 1/95

E = (k)(0.0032)[(U/5)^1.3]/[(M/2)^1.4]

k = particle size constant =	0.35	for PM10
k = particle size constant =	0.11	for PM2.5
U = average wind speed =	3.40	m/sec (based on average of five years of wind data for Lindberg Field)
=	7.61	mph
M = moisture content =	15.0%	(SCAQMD CEQA Handbook, Table A9-9-G-1, moist soil)
E = PM10 emission factor =	0.0001	lb/ton
E = PM2.5 emission factor =	0.00004	lb/ton

Loader Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03

E = (k)[(s/12)^0.9][(W/3)^0.45]

k = particle size constant =	1.5	for PM10
k = particle size constant =	0.23	for PM2.5
s = surface silt content =	8.50	(AP-42, Table 13.2.2-1, 12/03, construction haul route)
W = avg. vehicle weight =	14.83	tons (avg. of loaded and unloaded weights, 938G loader, Caterpillar Performance Handbook, 2004)
E = PM10 emission factor =	2.26	lb PM10/VMT
E = PM2.5 emission factor =	0.35	lb PM2.5/VMT
Soil Density =	1.05	ton/yd3 (Caterpillar Performance Handbook, 10/89)
Loader Bucket Capacity =	3.5	yd3 (938G loader, Caterpillar Performance Handbook, 2004)
=	3.68	ton/load
Daily Soil Transfer Rate =	588	ton/day (operating 8 hrs/day)
Daily Loader Trips =	160	loading trips/day
Loading Travel Distance =	50	ft/load (estimated)
Daily Loader Travel Distance =	8,000	ft/day
=	1.5	mi/day

Backhoe Trenching - Source: AP-42, Table 11.9-1 (dragline operations), 7/98

E = (0.75)(0.0021)(d^0.7)/(M^0.3)

d = drop height =	3	ft (estimated)
M = moisture content =	15.0%	(SCAQMD CEQA Handbook, Table A9-9-G-1, moist soil)
E = PM10 emission factor =	0.0015	PM10 lb/ton
E = PM2.5 emission factor =	0.0001	PM2.5 lb/ton
Backhoe Excavating Rate =	60.0	yd3/hr (based on 0.5 yd3 bucket on a Cat. 312 excavator and a 30 sec. Cycle time)
=	480	yd3/day for 1 backhoe @ 8 hrs/day of operation
Soil Density =	1.0500	ton/yd3 (Caterpillar Performance Handbook, 10/89)
Daily Soil Transfer Rate =	504.0000	ton/day (estimated)

Notes - Fugitive Dust Emission Calculations

Unpaved Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (k)[(s/12)^0.9*(W/3)^0.45

k = particle size constant =	1.5 for PM10
k = particle size constant =	0.23 for PM2.5
s = silt fraction =	8.50 (AP-42, Table 13.2.2-1, 12/03, construction
W = water truck avg. veh. weight =	10.0 tons empty (estimated)
=	39.4 tons loaded (estimated with 8,000 gallon water capacity)
=	24.7 tons average
W = dump truck avg. veh. weight =	15.0 tons (for heavy duty Diesel trucks)
=	40.0 tons (for heavy duty Diesel trucks)
=	27.5 tons (for heavy duty Diesel trucks)
W = forklift avg. veh. weight =	8.0 tons empty (estimated)
W = auto/pickup avg. vehicle weight =	2.4 tons (CARB Area Source Manual, 9/97)
W = delivery truck avg. veh. wt. =	27.5 tons (for heavy duty Diesel trucks)
W = 3 ton truck avg. veh. Wt =	5.4 tons (estimate)
W = scraper avg. veh. wt. =	28.2 tons empty (615 scraper, Caterpillar Performance Handbook, 10/89)
	48.6 tons loaded (615 scraper, Caterpillar Performance Handbook, 10/89)
	38.4 tons mean weight
W = fuel truck avg. veh. weight =	8.0 tons empty (estimated)
=	18.2 tons loaded (estimated with 3,000 gallons Diesel fuel capacity)
=	13.1 tons average

E = water truck emission factor =	2.84 lb PM10/VMT
E = dump truck emission factor =	2.98 lb PM10/VMT
E = forklift emiss. factor =	1.71 lb PM10/VMT
E = auto/pickup emiss. factor =	0.99 lb PM10/VMT
E = delivery truck emiss. factor =	2.98 lb PM10/VMT
E = 3-ton truck emiss. factor =	1.43 lb PM10/VMT
E = scraper emiss. factor =	3.46 lb PM10/VMT
E = fuel truck emiss. factor =	2.13 lb PM10/VMT
E = water truck emission factor =	0.44 lb PM2.5/VMT
E = dump truck emission factor =	0.46 lb PM2.5/VMT
E = forklift emiss. factor =	0.26 lb PM2.5/VMT
E = auto/pickup emiss. factor =	0.15 lb PM2.5/VMT
E = delivery truck emiss. factor =	0.46 lb PM2.5/VMT
E = 3-ton truck emiss. factor =	0.22 lb PM2.5/VMT
E = scraper emiss. factor =	0.53 lb PM2.5/VMT
E = fuel truck emiss. factor =	0.33 lb PM2.5/VMT

Gravel Road Travel - Source: AP-42, Section 13.2.2, 12/03.

E = (k)[(s/12)^0.9*(W/3)^0.45

k = particle size constant =	1.5 for PM10
k = particle size constant =	0.23 for PM2.5
s = silt fraction =	6.40 (AP-42, Table 13.2.2-1, 12/03, gravel road)
W = water truck avg. veh. weight =	10.0 tons empty (estimated)
=	39.4 tons loaded (estimated with 8,000 gallon water capacity)
=	24.7 tons average
W = dump truck avg. veh. weight =	15.0 tons (for heavy duty Diesel trucks)
=	40.0 tons (for heavy duty Diesel trucks)
=	27.5 tons (for heavy duty Diesel trucks)
W = forklift avg. veh. weight =	8.0 tons empty (estimated)
W = auto/pickup avg. vehicle weight =	2.4 tons (CARB Area Source Manual, 9/97)
W = delivery truck avg. veh. wt. =	27.5 tons (for heavy duty Diesel trucks)

E = auto/pickup emiss. factor =	0.77 lb PM10/VMT
E = delivery truck emiss. factor =	2.31 lb PM10/VMT
E = auto/pickup emiss. factor =	0.12 lb PM2.5/VMT
E = delivery truck emiss. factor =	0.35 lb PM2.5/VMT

Unpaved Road Travel and Active Excavation Area Control - Source: Control of Open Fugitive Dust Sources, U.S EPA, 9/88

C = 100 - (0.8)(p)(d)(t)/(i)

p = potential average hourly daytime	
evaporation rate =	0.39 mm/hr (EPA document, Figure 3-2, summer)
evaporation rate =	0.294 mm/hr (EPA document, Figure 3-2, annual)
d = average hourly daytime traffic rate =	37.0 vehicles/hr (estimated)
t = time between watering applications =	1.00 hr/application (estimated)
i = application intensity =	1.4 L/m2 (typical level in EPA document, page 3-23)
C = average summer watering control efficiency	91.5%
C = average annual watering control efficiency =	93.6%

Finish Grading - Source: AP-42, Table 11.9-1, 7/98

E = (0.60)(0.051)(S^2.0)

S = mean vehicle speed =	3.0 mph (estimate)
E = emission factor =	0.2754 PM10 lb/VMT
E = emission factor =	0.0193 PM2.5 lb/VMT

Bulldozer Operation and Scraper Excavation - Source: AP-42, Table 11.9.1, 7/98

E = (0.75)(s^1.5)/(M^1.4)

s = silt content =	8.5% (AP-42, Table 13.2.2-1, 12/03, construction haul route)
M = moisture content =	15.0% (SCAQMD CEQA Handbook, Table A9-9-G-1)
E = emission factor =	0.42 PM10 lb/hr
E = emission factor =	0.23 PM2.5 lb/hr

Notes: Onsite Combustion Emissions

(1) - Steady State Emission Factors from Table A2 of EPA November 2002 NR-009b Publication.
(2) - In use adjustment factors per Table A3 EPA November 2002 NR-009b Publication.
(3) - PM10 and SO2 adjustments due to Equation 5 and Equation 7 on pages 18 and 19, Respectively of EPA Report No. NR-009b
(4) - Calculation uses adjusted BSFC and assumed 7.1 lbs/gallon. The onroad emission factors are not adjusted.
(5) - Daily fuel use based on peak combustion month equipment schedule.
(6) - Annual fuel use based on average level during peak 12-month period.
(7) - Annual fuel use based on average level during entire construction period.