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Eagle Mountain Pumped Storage Project No. 13123 Final License Application

Technical Appendices for Exhibit E, Applicant Prepared Environmental Impact Statement. Volume 3 of 6

Palm Desert, California

Submitted to: Federal Energy Regulatory Commission
Submitted by: Eagle Crest Energy Company

Date: June 22, 2009
GEI Project No. 080473

12 Appendix C – Technical Memoranda

12.10 Appendix to Air Quality Analysis, Construction-Related Data

12.10 Appendix to Air Quality Analysis Construction-Related Data

Construction-related emissions are primarily associated the exhaust from heavy equipment (i.e., backhoes, bulldozers, graders, etc.), delivery trucks (i.e., cement trucks, dump trucks, etc.) and construction worker vehicles getting to and from the site; dust from site preparation, land clearing, material handling, equipment movement on unpaved areas, blasting, and demolition activities; and fugitive emissions from the storage/transfer of raw materials. These emissions are temporary in nature and generally confined to the construction site and the access/egress roadways.

Emissions from construction activities were estimated based on the projected construction activity schedule, the number of vehicles/pieces of equipment, the types of equipment/type of fuel used, vehicle/equipment utilization rates, and the year construction occurs. This information was derived directly from the *Estimated Schedule, Manpower and Equipment Utilization during Construction of the Eagle Mountain Pumped-Storage Project* developed by GEI Consultants, which is provided in Section 12.2.

Data regarding the number of pieces and types of construction equipment to be used on the project, the deployment schedule of equipment (monthly and annually), and the approximate daily operating time (including power level or usage factor) were estimated for each individual construction project based on the previously referenced schedule of construction activity. A construction workday of ten hours was used. However, construction equipment is assumed to operate between two and ten hours per day, based on available usage factors. Construction is expected to occur between 2012 and 2015.

Table AQ-1 provides a list of construction equipment, along with their horsepower, load factor, fuel type, Source Classification Code (SCC) designation and usage factor expected to be used.

The emission inventories for off-road (non-highway) equipment were calculated using emission factors obtained from the California Air Resources Board (CARB)'s OFFROAD emissions model (Version 2007). Emission factors for on-road (highway) pickup, dump trucks, concrete trucks, employee vehicles, and other on-road regulated vehicles were obtained from the CARB EMFAC motor vehicle emission model. Refer to Tables AQ-2 through AQ-6 for a summary of the emission factors developed for this analysis.

Emission factors for each equipment type were applied to the anticipated equipment work output (horsepower-hours of expected equipment use). Operating times for the

equipment were based on a five-day workweek and an eight-hour workday during which the equipment may be operating.

A usage factor accounting for the percentage of daily operation and a load factor accounting for the average throttle setting relative to capacity were used. That is, a usage factor of 0.75 equates to six hours of operation and a load factor of 0.62 equates to 62 percent of throttle capacity during operation. For the off-road equipment sulfur dioxide and particulate matter emission factors, a diesel sulfur content of 15 parts per million (ultra low sulfur diesel fuel) was assumed, based on EPA mandated regulations effective June 2010.

Table AQ-1
Construction Equipment

Equipment	Size (hp)	Load Factor	SCC	Usage Factor	Fuel Type
AIR COMPRESSOR	5	0.56	2265006015	0.41	4-Stroke Gasoline
BACKHOE / FRONT END LOADER	87	0.54	2270002060	0.26	Diesel
BACKHOE, TRACKED	75	0.55	2270002066	0.26	Diesel
CHIPPER, WOOD	18	0.78	2265004065	0.00	4-Stroke Gasoline
COMPACTOR	84	0.56	2270002015	0.40	Diesel
COMPACTOR	84	0.56	2270002015	0.55	Diesel
CONCRETE / GROUT PUMP	8	0.69	2265006010	0.42	4-Stroke Gasoline
CRANE, 40 TON	149	0.43	2270002045	0.72	Diesel
CRANE, 70 TON	208	0.43	2270002045	0.47	Diesel
DOZER, D5	175	0.59	2270002063	0.61	Diesel
DOZER, D6	248	0.59	2270002063	0.26	Diesel
DOZER, D8	358	0.59	2270002063	0.38	Diesel
DOZER, D10	539	0.59	2270002063	0.00	Diesel
DRILL, TRACKED	18	0.79	2265002033	0.38	4-Stroke Gasoline
DUMP TRUCK, 15 TON	233	0.57	2270002051	0.47	Diesel
DUMP TRUCK, 34 TON	381	0.57	2270002051	0.48	Diesel
DUMP TRUCK, SEMI TRAILER	618	0.57	2270002051	0.00	Diesel
EXCAVATOR	157	0.57	2270002036	0.41	Diesel
FORKLIFT, ROUGH TERRAIN	83	0.6	2270002057	0.52	Diesel
FRONT END LOADER, TRACKED	37	0.55	2270002072	0.00	Diesel
FRONT END LOADER, WHEELED	87	0.54	2270002060	0.44	Diesel

FUEL / SUPPORT TRUCK	381	0.57	2270002051	0.44	Diesel
GENERATOR, DIESEL	84	0.74	2270006005	0.42	Diesel
HYDROSEED SPRAYER, TRUCK MOUNTED	4	0.5	2265005035	0.00	4-Stroke Gasoline
MOTOR GRADER	1662	0.61	2270002048	0.32	Diesel
PILE DRIVER	85	0.78	2270002054	0.00	Diesel
PUMP TRUCK – CONCRETE	381	0.57	2270002051	0.39	Diesel
POWDER TRUCK	381	0.57	2270002051	0.00	Diesel
SCRAPER, 21 CY, SELF-PROPELLED	356	0.72	2270002018	0.00	Diesel
TRUCK, FLATBED	381	0.57	2270002051	0.36	Diesel
TUNNEL RIG	18	0.79	2265002033	0.49	4-Stroke Gasoline
WATER PUMP, DIESEL	84	0.74	2270006010	0.50	Diesel
WATER TRUCK	381	0.57	2270002051	0.41	Diesel
WELDER AND GENERATOR SET	84	0.74	2270006005	0.54	Diesel
EMPLOYEE VEHICLES				--	
CONCRETE MIXER TRUCK – 8CY		ON-ROAD VEHICLES		0.40	Composite
SEMI TRAILER TRUCK				0.44	

Source: OFFROAD 2007

Table AQ-2
Construction Equipment Emissions Factors for 2012

	Exhaust Emission Factor (g/hp-hr)								Evaporative Emission Factor (g/hp-hr)
SCC	ROG	CO	NOX	CO2	SO2	PM10	N2O	CH4	ROG
2265006015	11.373	134.347	5.163	429.438	0.015	0.140	0.635	0.649	0.942
2270002060	1.009	4.040	6.180	568.297	0.007	0.556	0.000	0.091	--
2270002066	0.837	3.909	5.398	568.297	0.007	0.475	0.000	0.075	--
2265004065	6.628	288.600	3.151	429.438	0.011	3.262	0.230	0.381	6.495
2270002015	1.017	3.949	6.379	568.297	0.007	0.554	0.000	0.092	--
2265006010	6.972	253.287	4.942	429.438	0.012	3.600	0.451	0.399	1.638
2270002045	0.771	3.422	5.845	568.297	0.006	0.339	0.000	0.070	--
2270002045	0.559	1.571	5.430	568.297	0.006	0.197	0.000	0.050	--
2270002063	0.970	3.743	7.158	568.297	0.006	0.415	0.000	0.088	--
2270002063	0.788	2.204	6.810	568.297	0.006	0.292	0.000	0.071	--
2270002063	0.717	3.261	6.182	568.297	0.006	0.259	0.000	0.065	--
2270002063	0.718	3.246	6.286	568.297	0.006	0.261	0.000	0.065	--
2265002033	6.854	266.795	4.297	429.438	0.011	3.600	0.269	0.393	1.109
2270002051	0.501	1.346	4.614	568.297	0.006	0.157	0.000	0.045	--
2270002051	0.472	1.390	4.063	568.297	0.006	0.147	0.000	0.043	--
2270002051	0.475	1.388	4.199	568.297	0.006	0.150	0.000	0.043	--
2270002036	0.653	3.382	4.872	568.297	0.006	0.288	0.000	0.059	--
2270002057	0.946	3.972	5.849	568.297	0.007	0.533	0.000	0.085	--
2270002072	1.330	5.196	5.350	568.296	0.007	0.402	0.000	0.120	--
2270006005	0.856	3.596	5.808	568.297	0.007	0.457	0.000	0.077	--
2265005035	10.108	165.825	4.627	429.438	0.015	0.140	0.698	0.580	--
2270002048	0.713	3.377	5.476	568.297	0.006	0.316	0.000	0.064	--
2270002054	1.043	3.985	6.272	568.297	0.007	0.583	0.000	0.094	--
2270002018	0.589	2.296	5.332	568.297	0.006	0.210	0.000	0.053	--
2270006010	0.887	3.653	5.897	568.297	0.007	0.477	0.000	0.080	--

Table AQ-3
Construction Equipment Emissions Factors for 2013

	Exhaust Emission Factor (g/hp-hr)								Evaporative Emission Factor (g/hp-hr)
SCC	ROG	CO	NOX	CO2	SO2	PM10	N2O	CH4	ROG
2265006015	11.375	134.370	5.162	429.438	0.015	0.140	0.635	0.649	0.942
2270002060	0.937	4.006	5.806	568.297	0.007	0.507	0.000	0.085	--
2270002066	0.764	3.877	5.018	568.297	0.007	0.421	0.000	0.069	--
2265004065	6.470	285.217	3.177	429.438	0.011	3.332	0.231	0.371	6.256
2270002015	0.951	3.915	6.027	568.297	0.007	0.515	0.000	0.086	--
2265006010	6.838	251.813	4.974	429.437	0.012	3.600	0.453	0.391	1.406
2270002045	0.730	3.410	5.498	568.297	0.006	0.315	0.000	0.066	--
2270002045	0.527	1.493	5.043	568.297	0.006	0.178	0.000	0.048	--
2270002063	0.931	3.712	6.832	568.297	0.006	0.392	0.000	0.084	--
2270002063	0.754	2.115	6.449	568.297	0.006	0.273	0.000	0.068	--
2270002063	0.689	3.049	5.857	568.297	0.006	0.243	0.000	0.062	--
2270002063	0.690	3.035	5.958	568.297	0.006	0.244	0.000	0.062	--
2265002033	6.756	265.782	4.332	429.438	0.011	3.600	0.270	0.388	0.976
2270002051	0.478	1.309	4.226	568.297	0.006	0.141	0.000	0.043	--
2270002051	0.453	1.327	3.730	568.297	0.006	0.132	0.000	0.041	--
2270002051	0.456	1.326	3.855	568.297	0.006	0.135	0.000	0.041	--
2270002036	0.612	3.377	4.527	568.297	0.006	0.260	0.000	0.055	--
2270002057	0.870	3.938	5.459	568.297	0.007	0.482	0.000	0.079	--
2270002072	1.153	5.041	5.075	568.297	0.007	0.350	0.000	0.104	--
2270006005	0.782	3.559	5.430	568.297	0.007	0.419	0.000	0.071	--
2265005035	10.110	165.786	4.628	429.438	0.015	0.140	0.698	0.580	--
2270002048	0.674	3.369	5.138	568.297	0.006	0.290	0.000	0.061	--
2270002054	0.960	3.941	5.848	568.297	0.007	0.533	0.000	0.087	--
2270002018	0.563	2.140	5.002	568.297	0.006	0.194	0.000	0.051	--
2270006010	0.812	3.614	5.513	568.297	0.007	0.438	0.000	0.073	--

Table AQ-4
Construction Equipment Emissions Factors for 2014

	Exhaust Emission Factor (g/hp-hr)								Evaporative Emission Factor (g/hp-hr)
SCC	ROG	CO	NOX	CO2	SO2	PM10	N2O	CH4	ROG
2265006015	11.376	134.392	5.162	429.438	0.015	0.140	0.635	0.649	0.941
2270002060	0.871	3.974	5.458	568.297	0.007	0.460	0.000	0.079	--
2270002066	0.698	3.849	4.675	568.297	0.007	0.370	0.000	0.063	--
2265004065	6.329	282.286	3.213	429.437	0.011	3.377	0.232	0.363	6.021
2270002015	0.888	3.883	5.693	568.297	0.007	0.476	0.000	0.080	--
2265006010	6.748	250.861	4.993	429.438	0.012	3.600	0.454	0.386	1.228
2270002045	0.692	3.400	5.171	568.297	0.006	0.291	0.000	0.062	--
2270002045	0.496	1.427	4.608	568.297	0.006	0.161	0.000	0.045	--
2270002063	0.893	3.683	6.522	568.297	0.006	0.369	0.000	0.081	--
2270002063	0.719	2.030	6.047	568.297	0.006	0.254	0.000	0.065	--
2270002063	0.659	2.852	5.490	568.297	0.006	0.227	0.000	0.059	--
2270002063	0.660	2.840	5.589	568.297	0.006	0.228	0.000	0.060	--
2265002033	6.696	265.135	4.356	429.438	0.011	3.600	0.271	0.384	0.875
2270002051	0.452	1.283	3.774	568.297	0.006	0.126	0.000	0.041	--
2270002051	0.431	1.280	3.329	568.297	0.006	0.118	0.000	0.039	--
2270002051	0.434	1.279	3.445	568.297	0.006	0.121	0.000	0.039	--
2270002036	0.575	3.373	4.219	568.297	0.006	0.232	0.000	0.052	--
2270002057	0.799	3.906	5.110	568.297	0.007	0.432	0.000	0.072	--
2270002072	0.987	4.890	4.811	568.297	0.007	0.299	0.000	0.089	--
2270006005	0.710	3.523	5.094	568.297	0.007	0.379	0.000	0.064	--
2265005035	10.107	165.875	4.626	429.437	0.015	0.140	0.698	0.580	--
2270002048	0.636	3.362	4.825	568.297	0.006	0.265	0.000	0.057	--
2270002054	0.879	3.899	5.471	568.297	0.007	0.482	0.000	0.079	--
2270002018	0.536	2.006	4.622	568.297	0.006	0.179	0.000	0.048	--
2270006010	0.739	3.578	5.172	568.297	0.007	0.397	0.000	0.067	--

Table AQ-5
Construction Equipment Emissions Factors for 2015

	Exhaust Emission Factor (g/hp-hr)								Evaporative Emission Factor (g/hp-hr)
SCC	ROG	CO	NOX	CO2	SO2	PM10	N2O	CH4	ROG
2265006015	11.378	134.414	5.162	429.438	0.015	0.140	0.635	0.649	0.941
2270002060	0.807	3.946	5.045	568.297	0.007	0.416	0.000	0.073	--
2270002066	0.635	3.824	4.255	568.297	0.007	0.323	0.000	0.057	--
2265004065	6.188	279.367	3.251	429.438	0.011	3.416	0.234	0.355	5.781
2270002015	0.827	3.854	5.299	568.297	0.007	0.438	0.000	0.075	--
2265006010	6.700	250.375	5.002	429.438	0.012	3.600	0.455	0.383	1.093
2270002045	0.651	3.391	4.732	568.297	0.006	0.268	0.000	0.059	--
2270002045	0.469	1.374	4.201	568.297	0.006	0.145	0.000	0.042	--
2270002063	0.853	3.657	6.124	568.297	0.006	0.347	0.000	0.077	--
2270002063	0.684	1.951	5.662	568.297	0.006	0.236	0.000	0.062	--
2270002063	0.629	2.670	5.139	568.297	0.006	0.211	0.000	0.057	--
2270002063	0.630	2.660	5.234	568.297	0.006	0.213	0.000	0.057	--
2265002033	6.664	264.808	4.369	429.438	0.011	3.600	0.272	0.382	0.800
2270002051	0.427	1.263	3.354	568.297	0.006	0.112	0.000	0.039	--
2270002051	0.409	1.241	2.958	568.297	0.006	0.105	0.000	0.037	--
2270002051	0.411	1.241	3.063	568.297	0.006	0.107	0.000	0.037	--
2270002036	0.533	3.369	3.755	568.297	0.006	0.205	0.000	0.048	--
2270002057	0.730	3.877	4.702	568.297	0.007	0.383	0.000	0.066	--
2270002072	0.842	4.761	4.569	568.297	0.007	0.252	0.000	0.076	--
2270006005	0.639	3.490	4.710	568.297	0.007	0.341	0.000	0.058	--
2265005035	10.110	165.787	4.628	429.438	0.015	0.140	0.698	0.580	--
2270002048	0.596	3.357	4.377	568.297	0.006	0.241	0.000	0.054	--
2270002054	0.799	3.860	5.044	568.297	0.007	0.431	0.000	0.072	--
2270002018	0.510	1.888	4.263	568.297	0.006	0.164	0.000	0.046	--
2270006010	0.667	3.544	4.781	568.297	0.007	0.357	0.000	0.060	--

Source: CARB OFFROAD2007

Table AQ-6
Motor Vehicle Emissions Factors

Light Duty Auto -- Emission Factor (g/mile)									
Year	**ROG**	**CO**	**NOX**	**CO2**	**SO2**	**PM10**	**PM2.5**	**N2O**	**CH4**
2012	0.073	2.400	0.218	310.221	0.003	0.032	0.017	0.005	0.022
2013	0.062	2.138	0.193	309.667	0.003	0.032	0.017	0.005	0.020
2014	0.052	1.910	0.159	309.214	0.003	0.032	0.017	0.005	0.018
2015	0.044	1.718	0.152	308.851	0.003	0.032	0.017	0.005	0.016
Heavy Heavy Duty Vehicle -- Emission Factor (g/mile)									
Year	**ROG**	**CO**	**NOX**	**CO2**	**SO2**	**PM10**	**PM2.5**	**N2O**	**CH4**
2012	1.050	5.161	11.967	2027.333	0.019	0.540	0.459		0.050
2013	0.948	4.601	10.574	2026.682	0.019	0.472	0.397		0.045
2014	0.850	4.078	9.047	2026.088	0.019	0.411	0.340		0.041
2015	0.761	3.615	8.101	2025.597	0.019	0.358	0.291		0.036

Source: CARB EMFAC 2007

For on-road employee vehicles, the anticipated vehicle miles traveled were estimated to determine annual emissions. Assumptions included a one-way trip distance of 65 miles and two trips per day (from Indio and Palm Desert) for employee trips. For on-road haul trucks, the anticipated vehicle miles traveled were estimated to determine annual emissions. Assumptions included a one-way trip distance of 5 miles and two trips per day for onsite concrete and dump trucks and a one-way trip distance of 150 miles and two trips per day for offsite hauling (from Ontario). The number of haul trucks was based on the *Schedule, Manpower and Equipment Utilization during Construction of the Eagle Mountain Pumped-Storage Project* developed by GEI Consultants and applied to a grams-mile emissions factor. The following equations were used to obtain annual emission rates for off-road equipment and on-road vehicles:

*Emission Rate (tons/year) = OFFROAD Emission Factor (g/hp-hr) * size (hp) * 8 hours per day * days/year * Load Factor * Usage Factor * (453.59/2000 tons/g)*

*Emission Rate (tons/year) = EMFAC Emission Factor (g/mile) * trips per day * miles per trip * days/year * (453.59/2000 tons/g)*

*Emission Rate (tons/year) = EMFAC Emission Factor (g/hour) * total hours in use * Usage Factor * (453.59/2000 tons/g)*

Additionally, the construction emissions inventories for fugitive dust sources were calculated using emission factors within EPA's AP-42 and SCAQMD *CEQA Air Quality Handbook* and other publications. Fugitive dust emissions result from the following activities: grading, moving soil, and digging, loading/unloading of trucks, movement of trucks on unpaved surfaces, and wind erosion of stockpiles. A PM_{10} fugitive dust emission factor of 26.4 pounds per day per acre disturbed was used. $PM_{2.5}$ was assumed to be 20.8 percent and 92 percent of PM_{10} for the purposes of this analysis for fugitive dust and offroad equipment, respectively, based on SCAQMD's $PM_{2.5}$ fractions within the *CEQA Air Quality Handbook*.

Erosion control measures and water programs are typically taken to minimize these fugitive dust and particulate emissions. A dust control efficiency of 75 percent due to daily watering and other measures was estimated. Application of water reduces fugitive dust emissions by a factor of approximately 34 to 68 percent (per SCAQMD *CEQA Air Quality Handbook*). It is assumed that one water application per day reduces fugitive dust by 34 percent, two water applications per day reduces fugitive dust by 50 percent, and three water applications per day reduces fugitive dust by 68 percent. Additional measures would allow for a total control efficiency of 75 percent and compliance with SCAQMD Rule 403.

Additionally, construction activities (i.e. tunnel excavation) that involved blasting employed the following emissions factor[1]:

*Blasting Emissions Factor (lbs PM_{10} per day) = 0.2 * 961 * Blast Area (sq.ft)$^{0.8}$ / [Blast Depth (ft)$^{1.8}$ * Moisture Content (%)$^{1.9}$]*

Square footage of the blast area for each associated task was derived from the *Schedule, Manpower and Equipment Utilization during Construction of the Eagle Mountain Pumped-Storage Project* developed by GEI Consultants, and if a blast depth was not provided, 30 feet was assumed. Additionally, one percent moisture content was applied.

[1] Source: *Sonoma County Aggregate Resources Management Plan and Environmental Impact Report (Sonoma County, 1994)*

Concrete Batch Plant

Concrete is composed essentially of water, cement, sand (fine aggregate), and coarse aggregate, consisting of crushed stone. Sand, aggregate, cement, and water are all gravity fed from a weigh hopper into the mixer trucks. The cement is transferred to elevated storage silos. The sand and coarse aggregate are transferred to elevated bins. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

Air emissions were determined for the operation of the concrete batching plants. The air emission calculations accounted for the proposed production level, the number, types, and size of equipment. The emission factors can be calculated using the methodology found in EPA *Compilation of Air Pollutant Emission Factors* (AP-42) Section 11.12. The cement unloading and truck loading points have air emission controls applied to them.

Construction Activities

The construction requirements for the Proposed Project will involve a variety of air emissions sources including on- and off-road construction vehicles, machinery and equipment. These emission sources are associated with the following activities:

- Site preparation and earth-moving;
- Transport and placement of fill;
- Leveling and grading of project footprint;
- Drilling, blasting and excavation of tunnel sites;
- Storage and movement of raw and construction materials; and
- Other miscellaneous construction operations (e.g., installation of roadways and underground utilities.).

This section outlines the procedures, data sources, and other analytical parameters to be used in developing the air emissions estimates for constructing the Proposed Project.

Construction Equipment Types

For the purposes of this analysis, the construction equipment types will be subdivided into two categories: off-road equipment and on-road vehicles. Off-road equipment is used to move and grade fill materials, install utilities, pave surfaces, construct necessary structures and install other miscellaneous support features. These include a wide array of scrapers, loaders, dozers, cranes and off-road haul trucks. On-road vehicles include transport trucks for the delivery of raw materials, supplies and equipment, as well as the personal vehicles used by the construction workers. Typical on-road vehicles include automobiles, vans and trucks of various sizes and functions.

Activity Levels and Load Factors

Activity levels are defined as the hours of operation for a piece of equipment over a given time, and load factors are the engine performance demands, as a percent of maximum power. Equipment activity levels are based on the construction requirements and schedule for each project component. GEI Consultants have reviewed the work cycles for each type of equipment to estimate an average activity level for each project and type of equipment. These estimated activity levels for the construction equipment vary depending on the individual project elements and phase.

The peak work force is estimated to be 209 laborers. The total work force is estimated to be 4,674 person months over the duration of construction. The peak monthly on-site equipment items are estimated to be 150 items. The peak daily concrete trucks (on-site) are estimated to be 210 trucks. This estimate assumes the trucks are traveling to and from an on-site batch plant. The peak daily heavy trucks (on-site) are estimated to be 258 trucks. This estimate assumes the trucks are hauling materials to and from locations on-site. The peak monthly off-site truck volume is estimated to be 79 trucks. The total off-site truck volume is estimated to be 925 trucks for the duration of construction. This estimate assumes the off-site trucks are importing the necessary construction materials to the site such as steel linings, steel reinforcement, electrical components, etc.

The average crew size for each major feature of the project construction, the associated average duration in months, and the total number of person months for each item and for the complete project were provided. The type and total number of equipment required for each major feature of the project construction were also provided. Equipment and crew size calculation spreadsheets for each major feature of the project construction were also provided.

Equipment & Vehicle Emissions Factors

The construction-related emission inventories were calculated using emission factors obtained from the CARB OFFROAD 2007 model and EMFAC2007 model, as well as U.S. EPA's *Compilation of Air Pollutant Emission Factors* (AP-42), SCAQMD's *CEQA Air Quality Handbook*, and other accepted guidance.

Fugitive Dust

Fugitive dust emissions during construction are estimated based on the surface area disturbed, expected duration of activity in a given area, and an emissions factors and an emissions reduction based on expected control measures (under CEQA). This emissions factor accounts for fugitive dust emissions from land clearing, ground excavation, cut and fill operations, blasting and excavation operations vehicle travel over construction areas, and wind erosion of exposed areas.

Based on expected exposed area, the construction schedule and acceptable emission factors, the PM_{10} and $PM_{2.5}$ annual emissions from fugitive dust are expected to be 11.0

and 2.53 tons per year, respectively. The PM_{10} and $PM_{2.5}$ daily emissions from fugitive dust are expected to be 151 and 39.2 pounds per day, respectively.

Detailed Results

Construction-related annual and daily emissions associated with the Proposed Project are presented, segregated by project year, pollutant type, and equipment/vehicle category, in Tables AQ-7 through AQ-10. Offroad equipment amounts to a greater percentage of the emissions for all pollutants except PM_{10} and $PM_{2.5}$, which is dominated by fugitive dust sources.

Table AQ-7
Offroad Equipment Annual Construction Emissions (tons)

Year	CO	VOC	NO_X	PM_{10}	$PM_{2.5}$	SO_2	CO_2	N_2O	CH_4
2012	48.7	6.86	49.6	2.54	2.33	0.06	6,236	0.03	0.58
2013	46.3	7.01	49.1	2.52	2.32	0.07	6,486	0.03	0.60
2014	48.7	7.13	47.3	2.49	2.29	0.07	7,012	0.04	0.61
2015	13.3	1.58	9.20	0.56	0.51	0.02	1,445	0.02	0.13

Source: KB Environmental Sciences, Inc., 2009.

Table AQ-8
Onroad Vehicles Annual Construction Emissions (tons)

Year	CO	VOC	NO_X	PM_{10}	$PM_{2.5}$	SO_2	CO_2	N_2O	CH_4
2012	10.3	0.60	4.60	0.29	0.21	0.02	1,762	0.02	0.10
2013	11.5	0.85	7.54	0.43	0.32	0.02	2,535	0.02	0.11
2014	11.5	0.54	3.65	0.30	0.20	0.02	2,285	0.03	0.11
2015	2.52	0.08	0.41	0.05	0.03	0.005	486	0.01	0.02

Source: KB Environmental Sciences, Inc., 2009.

Table AQ-9
Offroad Equipment Daily Construction Emissions (pounds)

Year	CO	VOC	NO_X	PM_{10}	$PM_{2.5}$	SO_2
2012	375	52.8	382	19.5	18.0	0.49
2013	356	53.9	378	19.4	17.8	0.52
2014	375	54.8	364	19.1	17.6	0.56
2015	102	12.2	70.8	4.29	3.95	0.12

Source: KB Environmental Sciences, Inc., 2009.

Table AQ-10
Offroad Equipment Daily Construction Emissions (pounds)

Year	CO	VOC	NO_X	PM_{10}	$PM_{2.5}$	SO_2
2012	79.0	4.59	35.4	2.21	1.60	0.13
2013	88.4	6.58	58.0	3.31	2.48	0.19
2014	88.5	4.17	28.1	2.30	1.51	0.17
2015	19.4	0.62	3.17	0.41	0.24	0.04

Source: KB Environmental Sciences, Inc., 2009.