Appendix C

Wind
Reasonably Foreseeable Development Scenario

WIND
REASONABLY FORESEEABLE DEVELOPMENT SCENARIO
WEST CHOCOLATE MOUNTAINS

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WIND
REASONABLY FORESEEABLE DEVELOPMENT SCENARIO
WEST CHOCOLATE MOUNTAINS

1. Introduction

This Reasonably Foreseeable Development (RFD) scenario has been prepared as a basis for analyzing environmental impacts resulting from future leasing and development of federal lands for wind energy projects within the West Chocolate Mountains Renewable Energy Evaluation Area (West Chocolate REEA, or the REEA). As the term "Reasonably Foreseeable Development" implies, the RFD scenario is a tool the Bureau of Land Management (BLM) can use to analyze the types of impacts that could be expected under an alternative being analyzed. A RFD is not a prediction of what would happen under a specific alternative.

The RFD scenario is intended to provide the information necessary to analyze potential cumulative impacts. The disturbance for production facility and associated infrastructure (e.g., road, pipelines, transmission lines, etc.) would be based on the facilities typical in surrounding area.

The foreseeable development described here could occur on any land within the West Chocolate REEA, regardless of surface ownership. This RFD scenario assumes that one 45-megawatt (MW) wind energy power plant would be developed. The anticipated surface disturbance for the area is summarized below (Table 1).

Table 1 Surface Disturbance for One 45-Megawatt Wind Energy Project in the West Chocolate REEA

	BLM Disturbance (acres)	Total Disturbance[1] (acres)
Initial	23	76
Final	12	40

Note:
[1] BLM and non-BLM land.

2. Available Data and Assumptions

Based on the available data and assumptions, wind energy development could occur on any land within the REEA, regardless of surface ownership. Of the 64,058 acres 29,929 acres are available for wind energy development on both private and BLM land (land withdrawn by the UBSR not included). Of this, 42 sections contain roughly 9,162 acres of surface land administered by the BLM (land withdrawn by the U.S. Bureau of Reclamation [USBR] not included), with the remainder being state or private land. To estimate the amount of anticipated development for the entire 29,929 acres which would potentially occur on BLM land, a simple ratio was developed to estimate the percentage of development that could occur on BLM-managed land. This ratio is

based on the percentage of land within the REEA that is managed by the BLM for geothermal leasing (31 percent [9,162 acres BLM/29,929 acres total]).

There are no direct data on which to base this RFD scenario. The amount of energy produced from wind energy development in the West Chocolate REEA would depend on the acreage devoted to such development and the MW output per wind turbine based on the model implemented. As part of the BLM study Final Programmatic Environmental Impact Statement (PEIS) on Wind Energy Development on BLM-Administered Lands in the Western United States (2005), the BLM and the U.S. Department of Energy (DOE) National Renewable Energy Laboratory (NREL) established a partnership to conduct assessments of wind energy on BLM-administered lands in the western United States. An initial assessment of renewable energy potential on BLM-administered lands was published in 2003. This assessment looked at an array of renewable resources, including wind. To determine where potential development might occur on the basis of land status and wind energy resources, NREL constructed a maximum potential development scenario (MPDS) using the same methodology used for the 2003 renewable energy assessment but using a different model, the Wind Deployment System (WinDS), to project the amount of wind power that might be generated over the next 20 years. Wind resource data, GIS data, and general screening criteria were used to identify the spatial distribution of the maximum possible extent of future wind energy development activities that might occur on BLM-administered lands. Maps depicting BLM-administered lands with low, medium, and high potential for wind energy development were constructed for each of the BLM Field Offices in the 11-state study area, including the El Centro Field Office. These maps were used to assess: (1) the distribution of BLM-administered lands on which wind energy development activities might be conducted; and (2) the total number of acres that might be impacted (BLM 2005).

Wind resources were assigned to seven different power classes on the basis of their resource potential, determined by a combination of wind power density and wind speed. Class 1 (Poor) had the lowest resource potential, and Class 7 (Superb) had the highest. The assembled wind resource data and GIS data, including major cities and towns, transmission lines, and major roads, were compiled and screened to construct the MPDS. The screening criteria were used to eliminate lands from the MPDS that were excluded from wind energy development by virtue of their status, classification, or some other administrative determination (BLM 2005).

Lands were then categorized into areas having a low, medium, or high potential for wind energy development over the next 20 years on the basis of their wind power classification (Table 2).

Table 2 Wind Power Classification*

Classification	Wind Potential	Economically Viable
1	Poor	No
2	Marginal	No
3	Fair	Yes in some instances. Will be fully viable upon development of low wind-speed turbines.
4	Good	Yes
5	Excellent	Yes

Table 2 Wind Power Classification*

Classification	Wind Potential	Economically Viable
6	Outstanding	Yes
7	Superb	Yes

*As wind technology develops areas that were determined to be poor or marginal may be upgraded and become an economically viable area for development.
Sources: BLM 2005, NREL 2007

The wind power estimates produced as part of the BLM's Wind Energy PEIS and based on NREL's wind power resource data (see Figure 1) show the West Chocolate REEA to have a wind potential of "Poor". These data were produced using the Mesomap system (a wind resource model) and historical weather data, and validated with available surface data by NREL and wind energy meteorological consultants (NREL 2007).

The 2009 Black & Veatch document "The Renewable Energy Transmission Initiative Phase 1B Final Report" (RETI report) identifies competitive renewable energy zones (CREZs) throughout western North America to help meet renewable energy production goals set by regions or states. The RETI report identifies the West Chocolate REEA of Imperial County as having no wind potential. The area in Imperial County closest to having viable wind energy potential is Imperial South, which has 45 MW of potential wind energy.

It is assumed that one 45-MW wind energy project would be developed. All projects on BLM-managed land are permitted by BLM using standard review methods that ensure protection of public safety and the natural environment, and are evaluated as part of the Federal Land Policy and Management Act (FLPMA) right-of-way (ROW) application and National Environmental Policy Act (NEPA) processes.

3. Activities Involved in Wind Energy Development

3.1 Exploration

As common practice, it is anticipated that meteorological (MET) towers would need to be constructed by wind energy developers on BLM-managed lands to gather meteorological and climatological data, thus determining the feasibility of wind energy development in the West Chocolate REEA.

Typically, one to three MET towers would be installed in a given area to measure the wind resource. These towers would likely be less than 200 feet in height, supported by three to four arrays of guy wires to keep them erect. The base of the MET tower is typically a concrete foundation or an anchor. MET towers are usually in place for three years recording data. The ground footprint of a MET tower would be very small—less than 1 acre for an entire site.

3.2 Wind Farm Construction

Construction generally follows the sequence of planning; surveying and staking, construction of temporary use areas, and road building (30 days); foundation development and trenching for

underground electrical lines (60 days); tower and turbine delivery and placement (120 days); electrical line installation (30 days); and cleanup and reclamation (30 days).

Planning Construction Workforce Numbers, Vehicles, Equipment, Timeframes

Prior to mobilization for construction, a detailed plan is usually developed to define the supervisory and technical field organizations and staffing levels required for any wind project. The number of persons on site during construction is expected to be approximately 50. Equipment anticipated during various stages of construction would include bulldozers, backhoe/loaders, tracked excavators, trenchers, concrete mixers, compactors, cable trucks and trailers, delivery trucks, tractor/trailers, boom trucks, tracked cranes, rubber tired cranes, water trucks, and other miscellaneous trucks and passenger vehicles.

Surveying, Staking, and Road Building

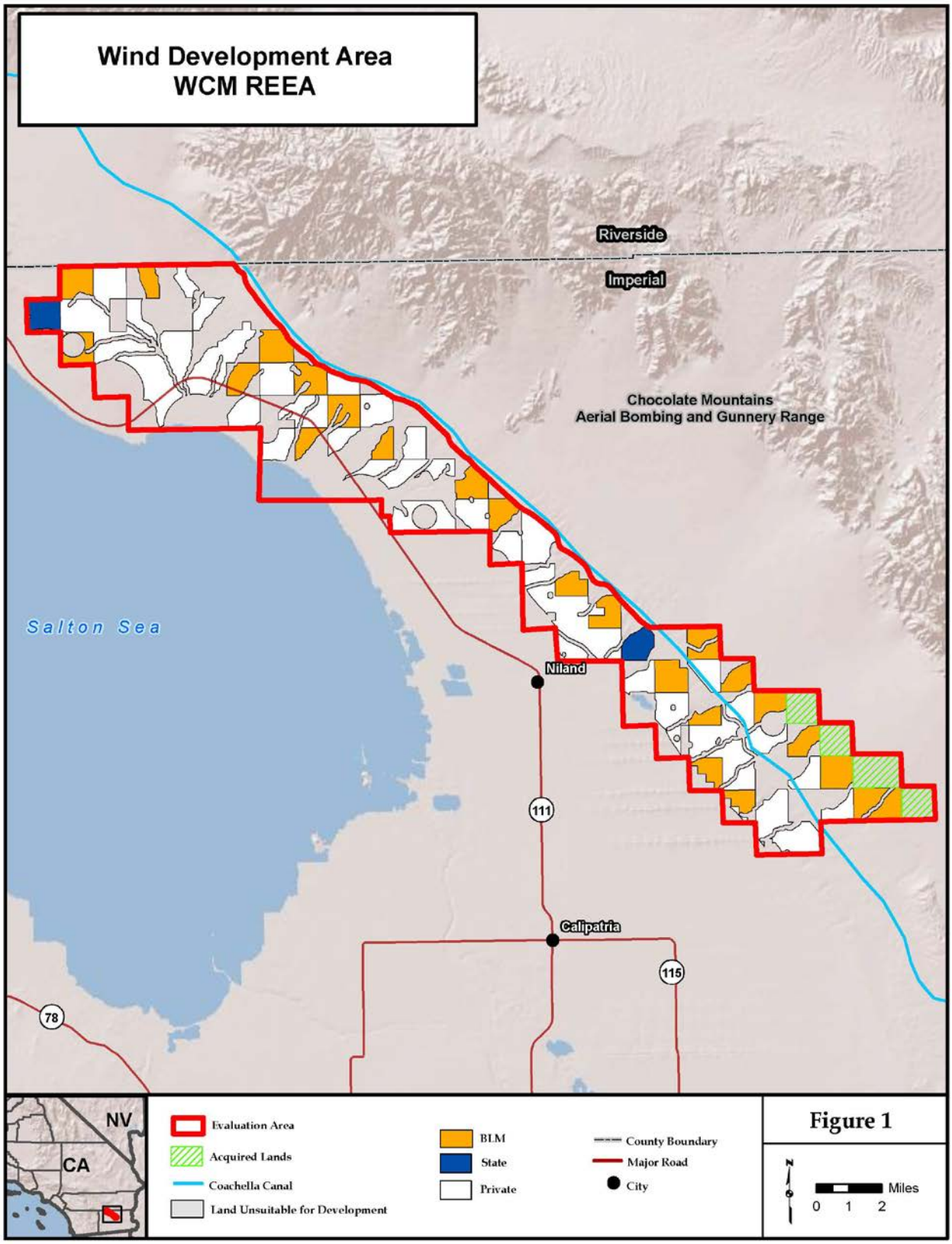
The first construction activities are typically surveying and staking, construction of temporary use areas, and building access roads to and throughout the site. The project perimeter would usually not be fenced; however, to minimize vandalism and theft, locked tower access doors would be installed on the turbines. Chain link fencing with concertina barbed wire may be installed at electrical substations and maintenance yards for security.

Site Plan

The layout would typically consist of roughly parallel rows of laterally spaced wind turbines, each with an adjacent pad-mounted transformer. Each row of wind turbines would be accessed by a network of new gravel roads whose alignments were chosen to minimize site grading and disturbance, while also avoiding very steep grades so that construction and operation of the site can be feasible. The alignment of the roads and turbines would follow the alignment of the topography on the site. The spacing of the wind turbines would vary somewhat from turbine to turbine, but always meet minimum spacing requirements of the turbine manufacturer so that harmful turbulence effects caused by adjacent wind turbines are minimized. This varying spacing and alignment somewhat would provide some relief from the rigid, regular spacing found at many wind projects.

Construction Temporary Use Areas Needed

During construction, staging and temporary storage of construction equipment, cable, foundation parts, components, towers, blades and nacelles would occur on small areas around the site. Construction trailers would be used at the maintenance yard during construction for contractor's management and temporary storage of parts and equipment. The maintenance yard would be fenced for security and safety purposes. The construction staging areas would be compacted and a soil stabilizer applied to prevent soil erosion and control dust. At areas outside the staging areas the ground surface and any vegetation would be protected by wooden frames, pallets or straw bales, which would be placed on the ground while the turbine components are unloaded, pre-assembled or inspected. Components, tower sections, nacelles and blades, would be delivered to the points of installation and would be placed on wooden frames, pallets or straw bales while they are awaiting installation.


Wind Development Area
WCM REEA
Riverside
Imperial
Chocolate Mountains
Aerial Bombing and Gunnery Range
Salton Sea
Niland
111
Calipatria
115
78
NV
CA
Evaluation Area
Acquired Lands
Coachella Canal
Land Unsuitable for Development
BLM
State
Private
County Boundary
Major Road
City
Figure 1
N
Miles
0 1 2

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In this RFD scenario, there would be approximately six miles of new roads. On private land approximately 4.5 miles of new gravel roads will be constructed, and 1.5 miles of new gravel roads will be constructed on BLM land. Typical proposed roads would be approximately 16 feet in width plus ten feet cleared shoulders on both sides, unless topography does not permit this width. The roads would consist of 4 inches to 6 inches of gravel over compacted native material. The majority of roads would be constructed at-grade, except where roads must be elevated or lowered to provide access to turbine sites or where steeper cut slopes must be used to minimize depths of cut to blend the road into the surroundings. Crossings at low spots would be at-grade, with no culverts or extensive fill except at a few limited locations. Upon completion of construction, the on-site roads would be smoothed where low spots and ruts have occurred, and 4 inches to 6 inches of gravel would be applied. This design would facilitate movement of wildlife around the site by minimizing barriers caused by abrupt changes in grade.

Locked tower access doors would be installed on the turbines to discourage theft and vandalism, and to minimize vehicular risk to biological resources. No restriction of existing BLM Open Roads or power line access roads would occur from development of access roads.

Foundation Development and Trenching for Underground Electrical Lines

Foundation development and trenching of underground electrical lines would typically follow in an overlapping schedule. Excavation of the foundations would be completed by large tracked excavators, to a depth of approximately 10 to 25 feet, depending on foundation design and soil conditions at the turbines. Steel reinforced concrete foundations with long bolts to hold the tower would be formed and poured at each turbine site. Conduits for the electrical lines would be installed prior to pouring concrete. For the transformers, a pad mount would be installed at each turbine site. The pad also provides storage in case of a transformer leak. Blasting would not be typically required.

Tower and Turbine Delivery and Placement

Tower and turbine components would be delivered to the site by truck and trailer. The towers would be assembled and hoisted into place by cranes. The nacelle would then be placed on the tower, and the blades would be attached to the rotor hub and hoisted into place. Alternatively, the hub would be mounted on the turbine and the blades would be installed individually.

Electrical Line Installation

Electrical lines would be typically installed in trenches parallel to the roads. The electrical lines would be connected to the transformers and turbines, and a fiber optic communication system would be typically installed.

Cleanup and Reclamation

After construction, all the temporary construction and staging areas would be cleaned up and revegetated.

3.3 Spill Prevention and Hazardous Maintenance

During construction, above-ground tanks of diesel fuel, gasoline, motor oil, hydraulic fluid, and coolant would be kept on site in a location with secondary containment. The tanks would be removed and petroleum products would not be stored after construction is completed. A spill prevention control and countermeasure (SPCC) plan would be prepared and implemented in accordance with all applicable regulations.

4. Surface Disturbance

To support 45 MW of net wind generation, fifteen 3-MW wind turbine generators would need to be erected within an approximately 1,300-acre footprint. The wind turbines would have dimensions and characteristics as shown in Table 3. These specifications would be subject to modification by the turbine manufacturer.

Table 3 Wind Turbine Characteristics

Rated Output	2.3 to 3.0 MW
Tower Height (Hub)	262.5 feet
Rotor Diameter	328.1 to 331.4 feet
Total Height	426.6 to 428.5 feet
Number of Blades per Turbine	3
Tower Type	Steel monopole

Source: Daggett Ridge Wind Energy POD 2009.

The development would occur on approximately 390 acres on BLM-administered land (approximately 30 percent of the site's 1,300 acres). The project's permanent footprint on BLM land would be 40 acres (0.03 percent of the total site area). Large areas of open, vacant desert exist between the individual turbines, rows of turbines, and the boundaries of the BLM parcels that could be developed for wind energy generation. Unobstructed open space is necessary for the free flow of wind, which results in efficient, safe, long-term operation of the wind turbine generators. Other uses would be compatible with the project on the site, provided those uses would not impede the flow of wind across the site, increase turbulence to the wind turbine rotors, or block access for maintenance of the wind turbines. Fiber optic line may be located within existing disturbed areas on existing rights-of-way; the disturbance footprint for these lines would be approximately 0.5 acre.

Total foreseeable surface disturbance for wind energy development is summarized below (Table 4).

Table 4 Surface Disturbance for Wind Energy Development

	BLM Property	Total Area[2]
Project Site Area	390 acres	1,300
Temporary Total Disturbance Area	10.8 acres	36
Permanent Total Project Footprint	12 acres	40
Total Disturbance Area (temporary plus permanent)	22.8 acres	76
Acreage of Access Roads	3.33 acres	9
Length of Project Roads & Access Roads	1.53 miles	4.5 miles

Source: Daggett Ridge Wind Energy POD 2009.
Notes:
[1] All numbers adjusted from the Daggett Ridge Wind Energy POD for a 50-MW project.
[2] BLM and Non BLM Land.

5. Operation and Maintenance

Routine operations and maintenance for a project this size are typically conducted by approximately four staff, using three 1½-ton pick-up trucks.

5.1 Road Maintenance

Roads would be inspected at least twice annually. Periodic blading or smoothing and application of gravel would be performed to maintain road quality. Maintenance of roads would be scheduled during times of low wind to minimize airborne dust. Vehicle speed limits of 20 mph on site would typically be posted and required of all operation and maintenance personnel to minimize airborne dust and erosion of roads and to minimize risk to desert tortoises that may be crossing roads.

5.2 Fire Protection and Site Security

All site facilities except wind turbine nacelles and blades are metal-contained, non-flammable structures. Habitable structures would not typically be built on site. Consequently, no fire protection equipment would be necessary except hand-held fire extinguishers, which are usually housed in the electrical substation utility building, maintenance yard (in a locked container), and on maintenance personnel trucks. Wind turbines, transformers, MET towers, and underground electrical facilities would be made with fire-resistant materials and are not expected to be damaged by brush fires or to increase the risk of fires in the area.

Individual wind turbines and transformers include heavy gauge steel locked doors equipped with anti-tamper locks and are very difficult to access without keys. Consequently, it would not be necessary to fence the perimeter of the site. Consequently, unauthorized trash dumping, vandalism and theft, and vehicle risk to desert tortoise would be minimized in those areas where project turbine roads are proposed. Other areas of the site would not be fenced or gated, and existing BLM Open Routes and existing power line access roads would remain open. Periodic site clean-up would be performed on an annual basis or more frequently. When routine daily maintenance is performed, the site would also be cleaned up by the maintenance personnel.

Fencing, except at substations and maintenance yards, would be designed to permit free movement of desert tortoise and other wildlife across the site. Approximately 100 to 300 feet of four-strand barbed wire fence would be placed adjacent to gated project entrances to discourage driving around gates. This type of fence is intended to allow movement of wildlife including desert tortoise. Fencing of the entire site would not be needed for site security.

6. Spill Prevention and Hazardous Materials on Site

6.1 Operation

Wind projects do not typically generate, store, use, or release any toxic substances regulated under the federal Toxic Substances Control Act (TSCA) or similar state or local laws and regulations. No hazardous chemicals or extremely hazardous substances as defined by the Emergency Planning and Community Right to Know Act (EPCRA) are present at wind projects in excess of the quantities for which reporting is required under Section 312 of EPCRA. All stockpiles of petroleum products, coolants, antifreeze, diesel fuel, gasoline, cleaning solvents, and used petroleum products would be housed and stored at the operation and maintenance facility.

Undetermined quantities of used hydraulic fluid, gear oil, and grease are typically generated annually from scheduled and unscheduled wind turbine maintenance. The used oil and grease would be collected on site and transported for recycling by a third-party contractor. The used oil would be expected to be non-hazardous and is not mixed with other substances prior to being picked up for recycling. Maintenance personnel would be trained in the procedures of spill prevention and countermeasures, and keep spill kits on their service vehicles for immediate use in case of a spill.

6.2 Secondary Containment of Oil

Wind turbine foundations and towers provide secondary containment so that if a leak occurs no petroleum products escape. Transformer foundations would be placed on grade and designed to provide containment of 125 percent of the volume of cooling oil in the transformer in the case of a leak. No petroleum products containing PCBs would be used.

7. Impacts

7.1 Noise

Possible significant increases in local noise levels could occur during the construction phase due to truck traffic to and from wind energy projects and noise resulting from the construction of the wind turbines and ancillary structures (e.g., operations and maintenance [O&M] buildings and substations). However, this increase in noise would be short term, concluding at the end of construction. The operation phase would not produce significant noise impacts.

7.2 Air Quality

Diesel engine exhaust and dust from trucks are the primary impacts to air quality from the construction of wind energy projects. Exhaust emissions can only be controlled by approved emission control devices on each vehicle, and dust emissions can be mitigated by periodic watering of roads.

7.3 Visual

Ideally, wind turbines would be sited using terrain to obstruct visual impacts to the extent possible. However, since wind turbines are tall, they are hard to conceal visually, especially in a topographically flat area. A BLM Visual Resource inventory would be performed in the West Chocolate REEA, and an interim Visual Resource Management (iVRM) class or classes would be assigned to the entire area. After iVRM class(es) are established, project-induced visual impacts would be assessed.

The project would include red lights approved by the Federal Aviation Administration (FAA) that would activate only from dusk until dawn. These lights would be synchronized to turn on and off in unison approximately once every three seconds, thereby substantially reducing the total number of times they turn on per minute and also minimizing the number of lights required. Only every third wind turbine would be lighted, and only one light would be installed per turbine. Using red lights and synchronizing the lights would greatly reduce the night sky impact of the lights. Security lights would be required at the substation; however, these lights would be hooded or directed downward to minimize stray light dispersion toward surrounding property. No other lights would be needed.

7.4 Biological Resources

Bird and bat species sustain the most significant impacts from wind energy projects, due primarily to interference with migration patterns. Special-status species of raptors, bats, and migratory birds tend to be particularly vulnerable to wind turbines, and mitigation measures (e.g., raptor ultraviolet reflectors, post construction mortality surveys) would be implemented as part of a Plan of Development (POD) at the request of the BLM. Additionally, special-status plant surveys would be necessary prior to clearing and grading activities to determine possible mitigation measures for impacts to those species.

7.5 Airspace

Wind turbines cause a particular hazard to military and civilian aeronautical activities. Consultation with the FAA would be necessary prior to construction to select a turbine layout that would mitigate potential impacts to all local aviation routes and activities.

The FAA would review the proposed project wind turbines prior to construction. Form 7460-1 would be prepared for the project and submitted to FAA to notify them that the proposed structures would exceed 200 feet in height. This action would result in a determination by FAA as to whether or not the project would constitute an obstruction or safety hazard to air navigation.

8. References

Black & Veatch. 2009. Renewable Energy Transmission Initiative (RETI) Phase 1B Final Report. January.

Bureau of Land Management (BLM). 2005. Wind Energy Final Programmatic Environmental Impact Statement (EIS), Appendix B: National Renewable Energy Laboratory Estimates Of Wind Energy Resources on BLM-Administered Lands. June.

National Renewable Energy Laboratory (NREL). 2007. 50m Wind Power Resource Map. September 25.

Plan of Development and Plan of Operation. 2009. Daggett Ridge Wind Energy Project. R/W GRANT CACA – 43088. Amended April 27.

Appendix D

Air Emissions Summaries

GEOTHERMAL RFDS - EMISSION SUMMARIES

Year 1: Exploratory Drilling

	Annual Emissions (T/Yr)					GHG Emissions (MT/year)	
Type	PM-10	NOX	VOC	SO2	CO	CO2	CO2e
Well Drilling - Fugitive	0.02	---	---	---	---	---	---
Well Drilling - Combustion	0.47	17.55	2.97	2.77	24.30	1553	1553
Construction	31.76	52.39	4.22	3.48	11.34	1278	1278
On-road vehicles	5.08	0.09	0.01	0.00	0.10	19	19
Totals	**37.33**	**70.04**	**7.21**	**6.25**	**35.74**	**2850**	**2850**

Year 2: Full Diameter Drilling and First Power Plant (50MW)

	Annual Emissions (T/Yr)					GHG Emissions (MT/year)	
Type	PM-10	NOX	VOC	SO2	CO	CO2	CO2e
Well Drilling - Fugitive	0.03	---	---	---	---	---	---
Well Drilling - Combustion	0.63	23.40	3.96	3.69	32.40	2070	2070
Construction	113.41	226.28	18.24	15.05	48.97	931	931
On-road vehicles	15.30	1.12	0.15	0.00	0.95	210	211
Totals	**129.36**	**250.80**	**22.34**	**18.74**	**82.32**	**3212**	**3212**

Year 3: Full Diameter Drilling and Second Power Plant (50MW)

	Annual Emissions (T/Yr)					GHG Emissions (MT/year)	
Type	PM-10	NOX	VOC	SO2	CO	CO2	CO2e
Well Drilling - Fugitive	0.03	---	---	---	---	---	---
Well Drilling - Combustion	0.63	23.40	3.96	3.69	32.40	2070	2070
Construction	113.41	226.28	18.24	15.05	48.97	931	931
On-road vehicles	15.29	1.00	0.13	0.00	0.87	211	211
Totals	**129.36**	**250.68**	**22.33**	**18.74**	**82.24**	**3212**	**3212**

Year 4: Full Diameter Drilling and Third Power Plant (50MW)

	Annual Emissions (T/Yr)					GHG Emissions (MT/year)	
Type	PM-10	NOX	VOC	SO2	CO	CO2	CO2e
Well Drilling - Fugitive	0.03	---	---	---	---	---	---
Well Drilling - Combustion	0.63	23.40	3.96	3.69	32.40	2070	2070
Construction	113.41	226.28	18.24	15.05	48.97	931	931
On-road vehicles	15.29	0.89	0.12	0.00	0.80	211	211
Totals	**129.35**	**250.57**	**22.32**	**18.74**	**82.17**	**3212**	**3212**

Operational Emissions (On-road vehicles)

	Annual Emissions (T/Yr)					GHG Emissions (MT/year)	
Type	PM-10	NOX	VOC	SO2	CO	CO2	CO2e
On-road vehicles - Engine	0.003	0.021	0.024	0.000	0.219	36	36
On-road vehicles - Fugitive dust	4.271	---	---	---	---	---	---
Totals	**4.27**	**0.02**	**0.02**	**0.00**	**0.22**	**36**	**36**

Table 1: Fugitive Emissions From Drilling Exploratory Wells (Year 1)

Activity	No. of Wells	Emission Factor[1] PM-10 (lb/hole)	Total Emissions[2] PM-10 (Tons/Project)
Drilling Wells	30	1.3	**0.0195**

Notes:

1. Emission Factor from AP-42, Table 11.9-4 (5th Edition).
2. Total Emissions = No. of wells x Emission Factor/(2000 lb/Ton).

Table 2: Emissions from Drilling Rig Engines for Initial Wells (Year 1)

Average Power Rating (hp)	500	30	Number of Wells
Fuel Type	Diesel	12	Operating Hours per day/drill rig
Total Operating Hours (hr/yr)[1]	7,200	20	Drilling days per well
Load Factor	0.75		

	POLLUTANTS					GHG
	PM-10	NOX	SO2	CO	VOC	CO2
Emission Factor (lb/hp-hr)[2,3]	0.00035	0.013	0.00205	0.01800	0.0022	1.15000
Total Emissions (Tons/Project)[4]	**0.47**	**17.55**	**2.77**	**24.3**	**2.97**	**1552.50**

Notes:

1. Total operating hours of all drill rigs.
2. Emission Factors from "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines," EPA420-F-97-014, Sept 1997, Nonroad CI Engines.
3. Emission Factor for SO2 from AP-42, Table 3.3-1 (5th Edition).
4. Total emissions = Average Power Rating x Total Operating Hours x Load Factor x Emission Factor/(2000 lb/ton).

Construction Emissions: Vehicle Engine Exhaust From Grading and Material Hauling Activities (Year 1)

Input Parameters/Assumptions:

Total Building Area:	0	ft^2
Total Paved Area:	0.00	ft^2
Total Disturbed Area:	95.00	acres
Construction Duration:	0.50	years
Annual Construction Activity:	250	days/yr
Total Demolition:	0	ft^2

<u>Area for Year 1</u>: Exploratory Drilling Disturbance: 95 acres;

Table 3 Summary of Input Parameters

	ROG[1]	NO_x	SO_2	CO	PM_{10}
Total new acres disturbed:	95	95	95	95	95
Total new building space, ft^2:	0	0	0	0	0
Total years:	0.5	0.5	0.5	0.5	0.5
Area graded, acres:	95	95	95	95	95

Emission Factors For Equipment Engine Exhaust From Construction Activities

Activity	SMAQMD Emission Factor									
	ROG[1]		NO_x		SO_2 [2]		CO [2]		PM_{10}	
Grading Equipment[3]	2.91E-01	lbs/acre/day	2.75E+00	lbs/acre/day	0.18	lbs/acre/day	0.60	lbs/acre/day	2.32E-01	lbs/acre/day
Material Hauling[4]	4.20E-01	lbs/acre/day	6.07E+00	lbs/acre/day	0.40	lbs/acre/day	1.31	lbs/acre/day	4.30E-01	lbs/acre/day

Reference: *Air Quality Thresholds of Significance* , Sacramento Metropolitan Air Quality Management District (SMAQMD), 1994 and *Compilation of Air Pollutant Emission Factors* (USEPA AP-42).

1 ROG = VOC.

2 Factors for grading equipment are calculated from AP-42 for diesel engines using ratios with the NOx factors.

3 Grading Activities assumes the use of one tracked loader, one wheeled loader, and one motor grader for each 10 acres of disturbed area, used 8 hours per day.

4 Material Hauling Activities assumes the use of one loader and one haul truck for each 10 acres of disturbed area, used 8 hours per day.

Table 4 Total Daily Equipment Engine Exhaust Emissions From Construction Actitivies[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	27.7	261.7	17.4	56.6	22.0
Material Hauling	39.9	576.7	38.3	124.8	40.9
Total Emissions (lbs/day):	**67.6**	**838.3**	**55.7**	**181.4**	**62.9**

1 Total Emissions (lbs/day) = Emission Factor * Affected Acres

Table 5 Total Emissions from Construction Activities[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	1.73	16.35	1.09	3.54	1.38
Material Hauling	2.49	36.04	2.40	7.80	2.55
Fugitive Emissions (from page 2)					27.83
Total Emissions(tons/yr)	**4.22**	**52.39**	**3.48**	**11.34**	**31.76**

1 Total emissions (TPY) = Total emissions (lbs/day) * days of construction / 2000 lbs per ton

Construction Emissions: Fugitive Emissions From Construction Activities (Year 1)

Input Parameters / Assumptions			
Acres affected:	95.0	acres/yr	**Exp.Drilling: 95 acres**
Grading days/yr:	21	days/yr	
Exposed days/yr:	21	days/yr graded area is exposed	
Grading Hours/day:	8	hr/day	
Soil percent silt, s:	15	%	
Soil percent moisture, M:	2	%	
Fraction of TSP, J:	0.5	(SCAQMD recommendation)	
Mean vehicle speed, S:	5	mi/hr	(On-site)
Dozer path width:	5	ft	
Qty construction vehicles:	3	vehicles	
On-site VMT/vehicle/day:	5	mi/veh/day	(Excluding bulldozer VMT during grading)

Reference: *CEQA Air Quality Handbook* , SCAQMD, April 1993.

Equation Used To Calculate Operation Parameters

Operation Parameter	Emission Factor	Units	Equation
Grading duration per acre	1.8	hr/acre	Grading days * hours per day / acres affected
Bulldozer mileage per acre	1.7	VMT/acre	Miles traveled by bulldozer, based on dozer path width
Construction VMT per day	15	VMT/day	Number of vehicle * VMT per vehicle per day
Construction VMT per acre	3.3	VMT/acre	Construction VMT * days of construction / acres affected
			(Travel on unpaved surfaces within site)

Equations Used To Calculate Mass/Unit Emission Factors (Corrected for PM_{10})

Operation	Empirical Equation	Units	AP-42 Section (4th Edition)
Bulldozing	0.75(s^1.5)/(M^1.4)	lbs/hr	8.24, Overburden
Grading	(0.60)(0.051)S^2.0	lbs/VMT	8.24, Overburden
Vehicle Traffic	(3.72/(M^4.3))*.6	lbs/VMT	8.24, Overburden

Reference: *Compilation of Air Pollutant Emission Factors*, USEPA AP-42:
Section 8.24, Western Surface Coal Mining (4th Edition)

Emission Factors For Fugitive Emissions From Construction Activities[1]

Operation	Emission Factor (mass/ unit)		Operation Parameter		Emission Factor (lbs/acre)	
Bulldozing	16.51	lbs/hr	1.8	hr/acre	29.7	lbs/acre
Grading	0.77	lbs/VMT	1.7	VMT/acre	1.3	lbs/acre
Vehicle Traffic	0.11	lbs/VMT	3.30	VMT/acre	0.4	lbs/acre

1 Emission Factor (lbs/acre) = Emission Factor (lbs per hour or VMT) * Operation Parameter (hours of VMT per acre)

Table 6 Calculation of Annual Fugitive Emissions from Construction Activities

Source	Emission Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing[1]	29.7	lbs/acre	95.00	NA	2,822	1.41
Grading[1]	1.3	lbs/acre	95.00	NA	124	0.06
Vehicle Traffic[1]	0.4	lbs/acre	95.00	NA	38	0.02
Erosion of Graded Surface[2]	26.4	lbs/acre/day[3]	95.00	21	52,668	26.33
TOTAL					**55,651**	**27.83**

1 Total annual emissions (TPY) = Emission Factor (lbs/acre) * affected acres * 2000 lbs per ton
2 Total annual emissions (TPY) from erosion = Emission Factor (lbs/acre) * days of construction * 2000 lbs per ton
3. Reference: CEQA Air Quality Handbook, SCAQMD, April 1993.

Projected Annual Emissions During Construction from On-Road Vehicles (Year 1)

On-Road Vehicles Emission Factors

			Emission Factor (pounds/mile)							
Scenario Year	Vehicle Type	EPA Category	CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
2012	Cars	LDGV	0.00765	0.00078	0.00080	0.00001	0.00009	0.00006	1.10153	0.00007
	Pickups	LDGT1	0.00765	0.00078	0.00080	0.00001	0.00009	0.00006	1.10153	0.00007
	Heavy Trucks	HDDV	0.01022	0.03092	0.00253	0.00004	0.00150	0.00129	4.21591	0.00012
	Trucks (3 axles)	LDDT	0.01546	0.01732	0.00224	0.00003	0.00065	0.00055	2.76628	0.00011

Source: SCAQMD 2010. Highest (Most Conservative) EMFAC2007 (version 2.3). Emission Factors for On-Road Vehicles and Heavy-Heavy-Duty Diesel Trucks

Key:

LDGV = Light-duty gasoline-fueled vehicles designated for transport of up to 12 people.

LDGT1 = Light-duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6,000 pounds or less.

LDDT = Light-duty diesel-powered trucks with a GVW of 8,500 pounds or less.

HDDV = Heavy-duty diesel-powered vehicles with a GVW exceeding 8,500 pounds.

Table 7-a Projected Criteria Air Pollutant Emissions From On-Road Vehicles

			Daily Travel - Per Vehicle					Annual Emissions (lb/yr)[1]							
Group	Vehicle Type	Daily Vehicles (/day)	At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
	Cars	10.0	4.0	0.0	4.0	180.0	7,200.0	55.1	5.6	5.7	0.1	0.6	0.4	7,931.0	0.5
	Pickups/Light Trucks	10.0	4.0	0.0	4.0	180.0	7,200.0	55.1	5.6	5.7	0.1	0.6	0.4	7,931.0	0.5
	Trucks	5.0	4.0	0.0	4.0	180.0	3,600.0	36.8	111.3	9.1	0.1	5.4	4.7	15,177.3	0.4
Vehicle Trips/Day	Heavy Trucks	5.0	4.0	0.0	4.0	180.0	3,600.0	55.6	62.4	8.1	0.1	2.3	2.0	9,958.6	0.4
30	**Total**	**30.0**	-	-	-	-	-	**202.65**	**184.9**	**28.6**	**0.4**	**9.0**	**7.5**	**40,997.9**	**1.8**
							TOTAL TPY[2]	**0.1013**	**0.092**	**0.014**	**0.000**	**0.005**	**0.004**	**18.602**	**0.001**

Notes:

1. Annual Emissions (lb/yr) = Emission Factor x Annual Travel/(453.6 g/lb)
2. Total TPY = Annual Emissions/(2000 lb/t). CO2 and CH4 are expressed as metric tones per year = Annual Emisisons/(2204 lb/MT)

Table 7-b Road Fugitive Emissions

			Daily Travel - Per Vehicle				
Group	Vehicle Type	Daily Vehicles (/day)	At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)
	Cars	10.0	4.0	0.0	4.0	180.0	7,200.0
	Pickups/Light Trucks	10.0	4.0	0.0	4.0	180.0	7,200.0
	Trucks	5.0	4.0	0.0	4.0	180.0	3,600.0
Vehicle Trips/Day	Heavy Trucks	5.0	4.0	0.0	4.0	180.0	3,600.0
30	**Total**	**30.0**	-	-	-	-	-

Table 8: Fugitive Emissions From Drilling Secondary Wells (Year 2)

Activity	No. of Wells	Emission Factor[1] PM-10 (lb/hole)	Total Emissions[2] PM-10 (Tons/Project)
Full Diameter Wells	40	1.3	**0.0260**

Notes:

1. Emission Factor from AP-42, Table 11.9-4 (5th Edition).
2. Total Emissions = No. of wells x Emission Factor/(2000 lb/Ton).

Table 9: Emissions from Drilling Rig Engines for Secondary Wells (Year 2)

Average Power Rating (hp)	500	40	Number of Wells
Fuel Type	Diesel	12	Operating Hours per day/drill rig
Total Operating Hours (hr/yr)[1]	9,600	20	Drilling days per well
Load Factor	0.75		

	POLLUTANTS					GHG
	PM-10	NOX	SO2	CO	VOC	CO2
Emission Factor (lb/hp-hr)[2,3]	0.00035	0.013	0.00205	0.01800	0.0022	1.15000
Total Emissions (Tons/Project)[4]	**0.63**	**23.4**	**3.69**	**32.4**	**3.96**	**2070.0**

Notes:
1. Total operating hours of all drill rigs.
2. Emission Factors from "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines," EPA420-F-97-014, Sept 1997, Nonroad CI Engines.
3. Emission Factor for SO2 from AP-42, Table 3.3-1 (5th Edition).
4. Total emissions = Average Power Rating x Total Operating Hours x Load Factor x Emission Factor/(2000 lb/ton).

Construction Emissions: Vehicle Engine Exhaust From Grading and Material Hauling Activities (Year 2)

Input Parameters/Assumptions:

Total Building Area:	1,306,800	ft^2
Total Paved Area:	156,816	ft^2
Total Disturbed Area:	341.90	acres
Construction Duration:	0.60	years
Annual Construction Activity:	250	days/yr
Total Demolition:	0	ft^2

Area for Year 2: Wellfield (50-MW): 272 acres; Power Plant: 69.9

Table 10 Summary of Input Parameters

	ROG[1]	NO_x	SO_2	CO	PM_{10}
Total new acres disturbed:	341.9	341.9	341.9	341.9	341.9
Total new building space, ft^2:	1306800.0	1306800.0	1306800.0	1306800.0	1306800.0
Total years:	0.60	0.60	0.60	0.60	0.60
Area graded, acres:	341.9	341.9	341.9	341.9	341.9

Emission Factors For Vehicle Engine Exhaust From Construction Activities

Activity	SMAQMD Emission Factor									
	ROG[1]		NO_x		SO_2 [2]		CO [2]		PM_{10}	
Grading Equipment[3]	2.91E-01	lbs/acre/day	2.75E+00	lbs/acre/day	0.18	lbs/acre/day	0.60	lbs/acre/day	2.32E-01	lbs/acre/day
Material Hauling[4]	4.20E-01	lbs/acre/day	6.07E+00	lbs/acre/day	0.40	lbs/acre/day	1.31	lbs/acre/day	4.30E-01	lbs/acre/day

Reference: *Air Quality Thresholds of Significance* , Sacramento Metropolitan Air Quality Management District (SMAQMD), 1994 and *Compilation of Air Pollutant Emission Factors* (USEPA AP-42).

1 ROG = VOC.

2 Factors for grading equipment are calculated from AP-42 for diesel engines using ratios with the NOx factors.

3 Grading Activities assumes the use of one tracked loader, one wheeled loader, and one motor grader for each 10 acres of disturbed area, used 8 hours per day.

4 Material Hauling Activities assumes the use of one loader and one haul truck for each 10 acres of disturbed area, used 8 hours per day.

Table 11 Total Daily Vehicle Engine Exhaust Emissions From Construction Actitivies[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	99.6	941.7	62.6	203.8	79.3
Material Hauling	143.6	2075.3	138.0	449.2	147.0
Total Emissions (lbs/day):	**243.2**	**3017.1**	**200.6**	**653.0**	**226.3**

1 Total Emissions (lbs/day) = Emission Factor * Affected Acres

Table 12 Total Vehicle Engine Exhaust Emissions from Construction Activities[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	7.47	70.63	4.70	15.29	5.95
Material Hauling	10.77	155.65	10.35	33.69	11.03
Fugitive Emissions (from page 2)					96.43
Total Emissions(tons/yr)	**18.24**	**226.28**	**15.05**	**48.97**	**113.41**

1 Total emissions (TPY) = Total emissions (lbs/day) * days of construction / 2000 lbs per ton

Construction Emissions: Fugitive Emissions From Construction Activities (Year 2)

Input Parameters / Assumptions			Drilling and Power Plant (One 50-MW Project)
Acres affected:	341.9	acres/yr	**Full Drilling: 272; Plant: 69.9**
Grading days/yr:	21	days/yr	
Exposed days/yr:	21	days/yr graded area is exposed	
Grading Hours/day:	8	hr/day	
Soil percent silt, s:	15	%	
Soil percent moisture, M:	2	%	
Fraction of TSP, J:	0.5	(SCAQMD recommendation)	
Mean vehicle speed, S:	5	mi/hr	(On-site)
Dozer path width:	5	ft	
Qty construction vehicles:	3	vehicles	
On-site VMT/vehicle/day:	5	mi/veh/day	(Excluding bulldozer VMT during grading)

Reference: *CEQA Air Quality Handbook* , SCAQMD, April 1993.

Equation Used To Calculate Operation Parameters

Operation Parameter	Emission Factor	Units	Equation
Grading duration per acre	0.5	hr/acre	Grading days * hours per day / acres affected
Bulldozer mileage per acre	1.7	VMT/acre	Miles traveled by bulldozer, based on dozer path width
Construction VMT per day	15	VMT/day	Number of vehicle * VMT per vehicle per day
Construction VMT per acre	0.9	VMT/acre	Construction VMT * days of construction / acres affected
			(Travel on unpaved surfaces within site)

Equations Used To Calculate Mass/Unit Emission Factors (Corrected for PM_{10})

Operation	Empirical Equation	Units	AP-42 Section (4th Edition)
Bulldozing	0.75(s^1.5)/(M^1.4)	lbs/hr	8.24, Overburden
Grading	(0.60)(0.051)S^2.0	lbs/VMT	8.24, Overburden
Vehicle Traffic	(3.72/(M^4.3))*.6	lbs/VMT	8.24, Overburden

Reference: *Compilation of Air Pollutant Emission Factors*, USEPA AP-42:
Section 8.24, Western Surface Coal Mining (4th Edition)

Emission Factors For Fugitive Emissions From Construction Activities[1]

Operation	Emission Factor (mass/ unit)		Operation Parameter		Emission Factor (lbs/acre)	
Bulldozing	16.51	lbs/hr	0.5	hr/acre	8.3	lbs/acre
Grading	0.77	lbs/VMT	1.7	VMT/acre	1.3	lbs/acre
Vehicle Traffic	0.11	lbs/VMT	0.90	VMT/acre	0.1	lbs/acre

1 Emission Factor (lbs/acre) = Emission Factor (lbs per hour or VMT) * Operation Parameter (hours of VMT per acre)

Table 13 Calculation of Annual Fugitive Emissions from Construction Activities

Source	Emission Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing[1]	8.3	lbs/acre	341.90	NA	2,838	1.42
Grading[1]	1.3	lbs/acre	341.90	NA	444	0.22
Vehicle Traffic[1]	0.1	lbs/acre	341.90	NA	34	0.02
Erosion of Graded Surface[2]	26.4	lbs/acre/day[3]	341.90	21	189,549	94.77
TOTAL					**192,866**	**96.43**

1 Total annual emissions (TPY) = Emission Factor (lbs/acre) * affected acres * 2000 lbs per ton
2 Total annual emissions (TPY) from erosion = Emission Factor (lbs/acre) * days of construction * 2000 lbs per ton
3. Reference: CEQA Air Quality Handbook, SCAQMD, April 1993.

Projected Annual Emissions During Construction from On-Road Vehicles (Year 2)

On-Road Vehicle Emission Factors

			Emission Factor (pounds/mile)							
Scenario Year	Vehicle Type	EPA Category	CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
2013	Cars	LDGV	0.00709	0.00071	0.00075	0.00001	0.00009	0.00006	1.10087	0.00007
	Pickups	LDGT1	0.00709	0.00071	0.00075	0.00001	0.00009	0.00006	1.10087	0.00007
	Heavy Trucks	HDDV	0.00932	0.02743	0.00226	0.00004	0.00134	0.00115	4.21519	0.00010
	Trucks (3 axles)	LDDT	0.01408	0.01577	0.00206	0.00003	0.00060	0.00050	2.78163	0.00010

Source: SCAQMD 2010. Highest (Most Conservative) EMFAC2007 (version 2.3). Emission Factors for On-Road Vehicles and Heavy-Heavy-Duty Diesel Trucks

Key:

LDGV = Light-duty gasoline-fueled vehicles designated for transport of up to 12 people.

LDGT1 = Light-duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6,000 pounds or less.

LDDT = Light-duty diesel-powered trucks with a GVW of 8,500 pounds or less.

HDDV = Heavy-duty diesel-powered vehicles with a GVW exceeding 8,500 pounds.

Table 14 Projected Criteria Air Pollutant Emissions From On-Road Vehicles

			Daily Travel - Per Vehicle					Annual Emissions (lb/yr)[1]							
Group	Vehicle Type	Daily Vehicles (/day)	At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
	Cars	20.0	4.0	10.0	14.0	180.0	50,400.0	357.5	35.9	37.6	0.5	4.6	2.9	55,484.1	3.4
	Pickups/Light Trucks	20.0	4.0	10.0	14.0	180.0	50,400.0	357.5	35.9	37.6	0.5	4.6	2.9	55,484.1	3.4
	Trucks	20.0	4.0	10.0	14.0	180.0	50,400.0	469.6	1,382.4	114.1	2.1	67.4	57.8	212,445.4	5.3
Vehicle Trips/Day	Heavy Trucks	20.0	4.0	10.0	14.0	180.0	50,400.0	709.5	795.0	104.0	1.4	30.2	25.3	140,194.4	4.9
80	**Total**	**80.0**	-	-	-	-	-	**1894.04**	**2,249.1**	**293.2**	**4.5**	**106.7**	**88.9**	**463,607.9**	**16.9**
							TOTAL TPY[2]	**0.9470**	**1.125**	**0.147**	**0.002**	**0.053**	**0.044**	**210.348**	**0.008**

Notes:

1. Annual Emissions (lb/yr) = Emission Factor x Annual Travel/(453.6 g/lb)

2. Total TPY = Annual Emissions/(2000 lb/t). CO2 and CH4 are expressed as metric tones per year = Annual Emisisons/(2204 lb/MT)

Table 14-b Road Fugitive Emissions

			Daily Travel - Per Vehicle				
Group	Vehicle Type	Daily Vehicles (/day)	At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)
	Cars	20	4	10	14	180	50,400
	Pickups/Light Trucks	20	4	10	14	180	50,400
	Trucks	20	4	10	14	180	50,400
Vehicle Trips/Day	Heavy Trucks	20	4	10	14	180	50,400
80	**Total**	**80.0**	-	-	-	-	-

Table 15: Fugitive Emissions From Drilling Secondary Wells (Year 3)

Activity	No. of Wells	Emission Factor[1] PM-10 (lb/hole)	Total Emissions[2] PM-10 (Tons/Project)
Drilling Wells	40	1.3	**0.0260**

Notes:

1. Emission Factor from AP-42, Table 11.9-4 (5th Edition).
2. Total Emissions = No. of wells x Emission Factor/(2000 lb/Ton).

Table 16: Emissions from Drilling Rig Engines for Secondary Wells (Year 3)

Average Power Rating (hp)	500	40	Number of Wells
Fuel Type	Diesel	12	Operating Hours per day/drill rig
Total Operating Hours (hr/yr)[1]	9,600	20	Drilling days per well
Load Factor	0.75		

	POLLUTANTS					GHG
	PM-10	NOX	SO2	CO	VOC	CO2
Emission Factor (lb/hp-hr)[2,3]	0.00035	0.013	0.00205	0.01800	0.0022	1.15000
Total Emissions (Tons/Project)[4]	**0.63**	**23.4**	**3.69**	**32.4**	**3.96**	**2070.0**

Notes:
1. Total operating hours of all drill rigs.
2. Emission Factors from "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines," EPA420-F-97-014, Sept 1997, Nonroad CI Engines.
3. Emission Factor for SO2 from AP-42, Table 3.3-1 (5th Edition).
4. Total emissions = Average Power Rating x Total Operating Hours x Load Factor x Emission Factor/(2000 lb/ton).

Construction Emissions: Vehicle Engine Exhaust From Grading and Material Hauling Activities (Year 3)

Input Parameters/Assumptions:

Total Building Area:	1,306,800	ft^2
Total Paved Area:	156,816	ft^2
Total Disturbed Area:	341.90	acres
Construction Duration:	0.60	years
Annual Construction Activity:	250	days/yr
Total Demolition:	0	ft^2

Area for Year 3: Wellfield (50-MW): 272 acres; Power Plant: 69.9

Table 17 Summary of Input Parameters

	ROG[1]	NO_x	SO_2	CO	PM_{10}
Total new acres disturbed:	341.9	341.9	341.9	341.9	341.9
Total new building space, ft^2:	1306800.0	1306800.0	1306800.0	1306800.0	1306800.0
Total years:	0.60	0.60	0.60	0.60	0.60
Area graded, acres:	341.9	341.9	341.9	341.9	341.9

Emission Factors For Vehicle Engine Exhaust From Construction Activities

Activity	SMAQMD Emission Factor									
	ROG[1]		NO_x		SO_2 [2]		CO [2]		PM_{10}	
Grading Equipment[3]	2.91E-01	lbs/acre/day	2.75E+00	lbs/acre/day	0.18	lbs/acre/day	0.60	lbs/acre/day	2.32E-01	lbs/acre/day
Material Hauling[4]	4.20E-01	lbs/acre/day	6.07E+00	lbs/acre/day	0.40	lbs/acre/day	1.31	lbs/acre/day	4.30E-01	lbs/acre/day

Reference: *Air Quality Thresholds of Significance* , Sacramento Metropolitan Air Quality Management District (SMAQMD), 1994 and *Compilation of Air Pollutant Emission Factors* (USEPA AP-42).

1 ROG = VOC.

2 Factors for grading equipment are calculated from AP-42 for diesel engines using ratios with the NOx factors.

3 Grading Activities assumes the use of one tracked loader, one wheeled loader, and one motor grader for each 10 acres of disturbed area, used 8 hours per day.

4 Material Hauling Activities assumes the use of one loader and one haul truck for each 10 acres of disturbed area, used 8 hours per day.

Table 18 Total Daily Vehicle Engine Exhaust Emissions From Construction Actitivies[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	99.6	941.7	62.6	203.8	79.3
Material Hauling	143.6	2075.3	138.0	449.2	147.0
Total Emissions (lbs/day):	**243.2**	**3017.1**	**200.6**	**653.0**	**226.3**

1 Total Emissions (lbs/day) = Emission Factor * Affected Acres

Table 19 Total Vehicle Engine Exhaust Emissions from Construction Activities[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	7.47	70.63	4.70	15.29	5.95
Material Hauling	10.77	155.65	10.35	33.69	11.03
Fugitive Emissions (from page 2)					96.43
Total Emissions(tons/yr)	**18.24**	**226.28**	**15.05**	**48.97**	**113.41**

1 Total emissions (TPY) = Total emissions (lbs/day) * days of construction / 2000 lbs per ton

Construction Emissions: Fugitive Emissions From Construction Activities (Year 3)

Input Parameters / Assumptions			
Acres affected:	341.9	acres/yr	
Grading days/yr:	21	days/yr	
Exposed days/yr:	21	days/yr graded area is exposed	
Grading Hours/day:	8	hr/day	
Soil percent silt, s:	15	%	
Soil percent moisture, M:	2	%	
Fraction of TSP, J:	0.5	(SCAQMD recommendation)	
Mean vehicle speed, S:	5	mi/hr	(On-site)
Dozer path width:	5	ft	
Qty construction vehicles:	3	vehicles	
On-site VMT/vehicle/day:	5	mi/veh/day	(Excluding bulldozer VMT during grading)

Reference: *CEQA Air Quality Handbook* , SCAQMD, April 1993.

Equation Used To Calculate Operation Parameters

Operation Parameter	Emission Factor	Units	Equation
Grading duration per acre	0.5	hr/acre	Grading days * hours per day / acres affected
Bulldozer mileage per acre	1.7	VMT/acre	Miles traveled by bulldozer, based on dozer path width
Construction VMT per day	15	VMT/day	Number of vehicle * VMT per vehicle per day
Construction VMT per acre	0.9	VMT/acre	Construction VMT * days of construction / acres affected
			(Travel on unpaved surfaces within site)

Equations Used To Calculate Mass/Unit Emission Factors (Corrected for PM_{10})

Operation	Empirical Equation	Units	AP-42 Section (4th Edition)
Bulldozing	0.75(s^1.5)/(M^1.4)	lbs/hr	8.24, Overburden
Grading	(0.60)(0.051)S^2.0	lbs/VMT	8.24, Overburden
Vehicle Traffic	(3.72/(M^4.3))*.6	lbs/VMT	8.24, Overburden

Reference: *Compilation of Air Pollutant Emission Factors,* USEPA AP-42:
Section 8.24, Western Surface Coal Mining (4th Edition)

Emission Factors For Fugitive Emissions From Construction Activities[1]

Operation	Emission Factor (mass/ unit)		Operation Parameter		Emission Factor (lbs/acre)	
Bulldozing	16.51	lbs/hr	0.5	hr/acre	8.3	lbs/acre
Grading	0.77	lbs/VMT	1.7	VMT/acre	1.3	lbs/acre
Vehicle Traffic	0.11	lbs/VMT	0.90	VMT/acre	0.1	lbs/acre

1 Emission Factor (lbs/acre) = Emission Factor (lbs per hour or VMT) * Operation Parameter (hours of VMT per acre)

Table 20 Calculation of Annual Fugitive Emissions from Construction Activities

Source	Emission Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing[1]	8.3	lbs/acre	341.90	NA	2,838	1.42
Grading[1]	1.3	lbs/acre	341.90	NA	444	0.22
Vehicle Traffic[1]	0.1	lbs/acre	341.90	NA	34	0.02
Erosion of Graded Surface[2]	26.4	lbs/acre/day[3]	341.90	21	189,549	94.77
TOTAL					**192,866**	**96.43**

1 Total annual emissions (TPY) = Emission Factor (lbs/acre) * affected acres * 2000 lbs per ton
2 Total annual emissions (TPY) from erosion = Emission Factor (lbs/acre) * days of construction * 2000 lbs per ton
3. Reference: CEQA Air Quality Handbook, SCAQMD, April 1993.

Projected Annual Emissions During Construction from On-Road Vehicles (Year 3)

On-Road Vehicles Emission Factors

Scenario Year	Vehicle Type	EPA Category	Emission Factor (pounds/mile) CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
2014	Cars	LDGV	0.006604	0.000655	0.000702	0.000011	0.000092	0.000059	1.102572	0.000063
	Pickups	LDGT1	0.006604	0.000655	0.000702	0.000011	0.000092	0.000059	1.102572	0.000063
	Heavy Trucks	HDDV	0.008464	0.024180	0.002016	0.000041	0.001185	0.001006	4.212793	0.000093
	Trucks (3 axles)	LDDT	0.012843	0.014252	0.001896	0.000028	0.000549	0.000455	2.798455	0.000088

Source: SCAQMD 2010. Highest (Most Conservative) EMFAC2007 (version 2.3). Emission Factors for On-Road Vehicles and Heavy-Heavy-Duty Diesel Trucks

Key:

LDGV = Light-duty gasoline-fueled vehicles designated for transport of up to 12 people.

LDGT1 = Light-duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6,000 pounds or less.

LDDT = Light-duty diesel-powered trucks with a GVW of 8,500 pounds or less.

HDDV = Heavy-duty diesel-powered vehicles with a GVW exceeding 8,500 pounds.

Table 21-a Projected Criteria Air Pollutant Emissions From On-Road Vehicles

Group	Vehicle Type	Daily Vehicles (/day)	Daily Travel - Per Vehicle At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (lb/yr)[1] CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
	Cars	20	4	10	14	180	50,400	332.8	33.0	35.4	0.5	4.6	3.0	55,569.6	3.2
	Pickups/Light Trucks	20	4	10	14	180	50,400	332.8	33.0	35.4	0.5	4.6	3.0	55,569.6	3.2
	Trucks	20	4	10	14	180	50,400	426.6	1,218.7	101.6	2.1	59.7	50.7	212,324.8	4.7
Vehicle Trips/Day	Heavy Trucks	20	4	10	14	180	50,400	647.3	718.3	95.6	1.4	27.7	22.9	141,042.1	4.4
80	**Total**	**80**	-	-	-	-	-	**1739.54**	**2,003.0**	**268.0**	**4.5**	**96.6**	**79.6**	**464,506.2**	**15.5**
							TOTAL TPY[2]	**0.8698**	**1.001**	**0.134**	**0.002**	**0.048**	**0.040**	**210.756**	**0.007**

Notes:

1. Annual Emissions (lb/yr) = Emission Factor x Annual Travel/(453.6 g/lb)
2. Total TPY = Annual Emissions/(2000 lb/t). CO2 and CH4 are expressed as metric tones per year = Annual Emisisons/(2204 lb/MT)

Table 21-b Road Fugitive Emissions

Group	Vehicle Type	Daily Vehicles (/day)	Daily Travel - Per Vehicle At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)
	Cars	20	4	10	14	180	50,400
	Pickups/Light Trucks	20	4	10	14	180	50,400
	Trucks	20	4	10	14	180	50,400
Vehicle Trips/Day	Heavy Trucks	20	4	10	14	180	50,400
80	**Total**	**80.0**	-	-	-	-	-

Table 22: Fugitive Emissions From Drilling Secondary Wells (Year 4)

Activity	No. of Wells	Emission Factor[1] PM-10 (lb/hole)	Total Emissions[2] PM-10 (Tons/Project)
Drilling Wells	40	1.3	**0.0260**

Notes:

1. Emission Factor from AP-42, Table 11.9-4 (5th Edition).
2. Total Emissions = No. of wells x Emission Factor/(2000 lb/Ton).

Table 23: Emissions from Drilling Rig Engines for Secondary Wells (Year 4)

Average Power Rating (hp)	500	40	Number of Wells
Fuel Type	Diesel	12	Operating Hours per day/drill rig
Total Operating Hours (hr/yr)[1]	9,600	20	Drilling days per well
Load Factor	0.75		

	POLLUTANTS					GHG
	PM-10	NOX	SO2	CO	VOC	CO2
Emission Factor (lb/hp-hr)[2,3]	0.00035	0.013	0.00205	0.01800	0.0022	1.15000
Total Emissions (Tons/Project)[4]	**0.63**	**23.4**	**3.69**	**32.4**	**3.96**	**2070.0**

Notes:
1. Total operating hours of all drill rigs.
2. Emission Factors from "Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines," EPA420-F-97-014, Sept 1997, Nonroad CI Engines.
3. Emission Factor for SO2 from AP-42, Table 3.3-1 (5th Edition).
4. Total emissions = Average Power Rating x Total Operating Hours x Load Factor x Emission Factor/(2000 lb/ton).

Construction Emissions: Vehicle Engine Exhaust From Grading and Material Hauling Activities (Year 4)

Input Parameters/Assumptions:

Total Building Area:	1,306,800	ft^2
Total Paved Area:	156,816	ft^2
Total Disturbed Area:	341.90	acres
Construction Duration:	0.60	years
Annual Construction Activity:	250	days/yr
Total Demolition:	0	ft^2

Area for Year 4: Wellfied (50 MW): 272 acres; Power Plant: 69.9 acres

Table 24 Summary of Input Parameters

	ROG[1]	NO_x	SO_2	CO	PM_{10}
Total new acres disturbed:	341.9	341.9	341.9	341.9	341.9
Total new building space, ft^2:	1306800.0	1306800.0	1306800.0	1306800.0	1306800.0
Total years:	0.60	0.60	0.60	0.60	0.60
Area graded, acres:	341.9	341.9	341.9	341.9	341.9

Emission Factors For Vehicle Engine Exhaust From Construction Activities

Activity	SMAQMD Emission Factor									
	ROG[1]		NO_x		SO_2 [2]		CO [2]		PM_{10}	
Grading Equipment[3]	2.91E-01	lbs/acre/day	2.75E+00	lbs/acre/day	0.18	lbs/acre/day	0.60	lbs/acre/day	2.32E-01	lbs/acre/day
Material Hauling[4]	4.20E-01	lbs/acre/day	6.07E+00	lbs/acre/day	0.40	lbs/acre/day	1.31	lbs/acre/day	4.30E-01	lbs/acre/day

Reference: *Air Quality Thresholds of Significance* , Sacramento Metropolitan Air Quality Management District (SMAQMD), 1994 and *Compilation of Air Pollutant Emission Factors* (USEPA AP-42).

1 ROG = VOC.

2 Factors for grading equipment are calculated from AP-42 for diesel engines using ratios with the NOx factors.

3 Grading Activities assumes the use of one tracked loader, one wheeled loader, and one motor grader for each 10 acres of disturbed area, used 8 hours per day.

4 Material Hauling Activities assumes the use of one loader and one haul truck for each 10 acres of disturbed area, used 8 hours per day.

Table 25 Total Daily Vehicle Engine Exhaust Emissions From Construction Actitivies[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	99.6	941.7	62.6	203.8	79.3
Material Hauling	143.6	2075.3	138.0	449.2	147.0
Total Emissions (lbs/day):	**243.2**	**3017.1**	**200.6**	**653.0**	**226.3**

1 Total Emissions (lbs/day) = Emission Factor * Affected Acres

Table 26 Total Vehicle Engine Exhaust Emissions from Construction Activities[1]

	ROG	NO_x	SO_2	CO	PM_{10}
Grading Equipment	7.47	70.63	4.70	15.29	5.95
Material Hauling	10.77	155.65	10.35	33.69	11.03
Fugitive Emissions (from page 2)					96.43
Total Emissions(tons/yr)	**18.24**	**226.28**	**15.05**	**48.97**	**113.41**

1 Total emissions (TPY) = Total emissions (lbs/day) * days of construction / 2000 lbs per ton

Construction Emissions: Fugitive Emissions From Construction Activities (Year 4)

Input Parameters / Assumptions			
Acres affected:	341.9	acres/yr	
Grading days/yr:	21	days/yr	
Exposed days/yr:	21	days/yr graded area is exposed	
Grading Hours/day:	8	hr/day	
Soil percent silt, s:	15	%	
Soil percent moisture, M:	2	%	
Fraction of TSP, J:	0.5	(SCAQMD recommendation)	
Mean vehicle speed, S:	5	mi/hr	(On-site)
Dozer path width:	5	ft	
Qty construction vehicles:	3	vehicles	
On-site VMT/vehicle/day:	5	mi/veh/day	(Excluding bulldozer VMT during grading)

Reference: *CEQA Air Quality Handbook* , SCAQMD, April 1993.

Equation Used To Calculate Operation Parameters

Operation Parameter	Emission Factor	Units	Equation
Grading duration per acre	0.5	hr/acre	Grading days * hours per day / acres affected
Bulldozer mileage per acre	1.7	VMT/acre	Miles traveled by bulldozer, based on dozer path width
Construction VMT per day	15	VMT/day	Number of vehicle * VMT per vehicle per day
Construction VMT per acre	0.9	VMT/acre	Construction VMT * days of construction / acres affected
			(Travel on unpaved surfaces within site)

Equations Used To Calculate Mass/Unit Emission Factors (Corrected for PM_{10})

Operation	Empirical Equation	Units	AP-42 Section (4th Edition)
Bulldozing	0.75(s^1.5)/(M^1.4)	lbs/hr	8.24, Overburden
Grading	(0.60)(0.051)S^2.0	lbs/VMT	8.24, Overburden
Vehicle Traffic	(3.72/(M^4.3))*.6	lbs/VMT	8.24, Overburden

Reference: *Compilation of Air Pollutant Emission Factors,* USEPA AP-42:
Section 8.24, Western Surface Coal Mining (4th Edition)

Emission Factors For Fugitive Emissions From Construction Activities[1]

Operation	Emission Factor (mass/ unit)		Operation Parameter		Emission Factor (lbs/acre)	
Bulldozing	16.51	lbs/hr	0.5	hr/acre	8.3	lbs/acre
Grading	0.77	lbs/VMT	1.7	VMT/acre	1.3	lbs/acre
Vehicle Traffic	0.11	lbs/VMT	0.90	VMT/acre	0.1	lbs/acre

1 Emission Factor (lbs/acre) = Emission Factor (lbs per hour or VMT) * Operation Parameter (hours of VMT per acre)

Table 27 Calculation of Annual Fugitive Emissions from Construction Activities

Source	Emission Factor		Graded Acres/yr	Exposed days/yr	Emissions lbs/yr	Emissions tons/yr
Bulldozing[1]	8.3	lbs/acre	341.90	NA	2,838	1.42
Grading[1]	1.3	lbs/acre	341.90	NA	444	0.22
Vehicle Traffic[1]	0.1	lbs/acre	341.90	NA	34	0.02
Erosion of Graded Surface[2]	26.4	lbs/acre/day[3]	341.90	21	189,549	94.77
TOTAL					**192,866**	**96.43**

1 Total annual emissions (TPY) = Emission Factor (lbs/acre) * affected acres * 2000 lbs per ton
2 Total annual emissions (TPY) from erosion = Emission Factor (lbs/acre) * days of construction * 2000 lbs per ton
3. Reference: CEQA Air Quality Handbook, SCAQMD, April 1993.

Projected Annual Emissions During Construction from On-Road Vehicles (Year 4)

On-Road Emission Factors

Scenario Year	Vehicle Type	EPA Category	Emission Factor (pounds/mile) CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
2015	Cars	LDGV	0.006141	0.000602	0.000664	0.000011	0.000093	0.000060	1.101928	0.000059
	Pickups	LDGT1	0.006141	0.000602	0.000664	0.000011	0.000093	0.000060	1.101928	0.000059
	Heavy Trucks	HDDV	0.007669	0.021227	0.001786	0.000041	0.001047	0.000880	4.209022	0.000084
	Trucks (3 axles)	LDDT	0.011694	0.012850	0.001739	0.000027	0.000503	0.000413	2.812477	0.000081

Note:

Emission factors from Calculation Methods for Criteria Air Pollutant Emission Inventories (Armstrong Laboratory,1994).

Key:

LDGV = Light-duty gasoline-fueled vehicles designated for transport of up to 12 people.

LDGT1 = Light-duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6,000 pounds or less.

LDDT = Light-duty diesel-powered trucks with a GVW of 8,500 pounds or less.

HDDV = Heavy-duty diesel-powered vehicles with a GVW exceeding 8,500 pounds.

Table 28-a Projected Criteria Air Pollutant Emissions From On-Road Vehicles

Group	Vehicle Type	Daily Vehicles (/day)	Daily Travel - Per Vehicle At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (lb/yr)[1] CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
	Cars	20	4	10	14	180	50,400	309.5	30.3	33.4	0.5	4.7	3.0	55,537.2	3.0
	Pickups/Light Trucks	20	4	10	14	180	50,400	309.5	30.3	33.4	0.5	4.7	3.0	55,537.2	3.0
	Trucks	20	4	10	14	180	50,400	386.5	1,069.8	90.0	2.1	52.8	44.3	212,134.7	4.2
Vehicle Trips/Day	Heavy Trucks	20	4	10	14	180	50,400	589.4	647.7	87.6	1.4	25.4	20.8	141,748.8	4.1
80	**Total**	**80.0**	-	-	-	-	-	**1594.93**	**1,778.2**	**244.5**	**4.5**	**87.5**	**71.2**	**464,957.9**	**14.3**
							TOTAL TPY[2]	**0.7975**	**0.889**	**0.122**	**0.002**	**0.044**	**0.036**	**210.961**	**0.006**

Notes:

1. Annual Emissions (lb/yr) = Emission Factor x Annual Travel/(453.6 g/lb)
2. Total TPY = Annual Emissions/(2000 lb/t). CO2 and CH4 are expressed as metric tones per year = Annual Emisisons/(2204 lb/MT)

Table 28-b Road Fugitive Emissions

Group	Vehicle Type	Daily Vehicles trips (/day)	Daily Travel - Per Vehicle At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)
	Cars	20	4	10	14	180	50,400
	Pickups/Light Trucks	20	4	10	14	180	50,400
	Trucks	20	4	10	14	180	50,400
Vehicle Trips/Day	Heavy Trucks	20	4	10	14	180	50,400
80	**Total**	**80.0**	-	-	-	-	-

Projected Annual Emissions from On-Road Vehicles During Operations

On-Road Emission Factors

Scenario Year	Vehicle Type	EPA Category	Emission Factor (pounds/mile) CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
2015	Cars	LDGV	0.006141	0.000602	0.000664	0.000011	0.000093	0.000060	1.101928	0.000059
	Pickups	LDGT1	0.006141	0.000602	0.000664	0.000011	0.000093	0.000060	1.101928	0.000059
	Heavy Trucks	HDDV	0.007669	0.021227	0.001786	0.000041	0.001047	0.000880	4.209022	0.000084
	Trucks (3 axles)	LDDT	0.011694	0.012850	0.001739	0.000027	0.000503	0.000413	2.812477	0.000081

Note:
Emission factors from Calculation Methods for Criteria Air Pollutant Emission Inventories (Armstrong Laboratory,1994).
Key:
LDGV = Light-duty gasoline-fueled vehicles designated for transport of up to 12 people.
LDGT1 = Light-duty gasoline-fueled trucks with a gross vehicle weight (GVW) rating of 6,000 pounds or less.
LDDT = Light-duty diesel-powered trucks with a GVW of 8,500 pounds or less.
HDDV = Heavy-duty diesel-powered vehicles with a GVW exceeding 8,500 pounds.

Table 29-a Projected Criteria Air Pollutant Emissions From On-Road Vehicles

Group	Vehicle Type	Daily Vehicles (/day)	Daily Travel - Per Vehicle At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)	Annual Emissions (lb/yr)[1] CO	NOx	ROG	SOx	PM10	PM2.5	CO2	CH4
	Cars	59.5	4.0	10.0	14.0	60.0	49,980.0	306.9	30.1	33.2	0.5	4.6	3.0	55,074.4	3.0
	Pickups/Light Trucks	25.5	4.0	10.0	14.0	60.0	21,420.0	131.5	12.9	14.2	0.2	2.0	1.3	23,603.3	1.3
	Trucks	0.0	4.0	10.0	14.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vehicle Trips/Day	Heavy Trucks	0.0	4.0	10.0	14.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	**Total**	**85.0**	-	-	-	-	-	**438.47**	**43.0**	**47.4**	**0.8**	**6.6**	**4.3**	**78,677.7**	**4.2**
							TOTAL TPY[2]	**0.2192**	**0.021**	**0.024**	**0.000**	**0.003**	**0.002**	**35.698**	**0.002**

Notes:
1. Annual Emissions (lb/yr) = Emission Factor x Annual Travel/(453.6 g/lb)
2. Total TPY = Annual Emissions/(2000 lb/t).

Table 29-b Road Fugitive Emissions

Group	Vehicle Type	Daily Vehicles trips (/day)	Daily Travel - Per Vehicle At Plant (VMT)	Off-Plant (VMT)	Total (VMT)	Travel Days (days/yr)	Annual Travel (VMT/yr)
	Cars	60.0	4.0	10.0	14.0	60.0	50,400.0
	Pickups/Light Trucks	25.0	4.0	10.0	14.0	60.0	21,000.0
	Trucks	0.0	4.0	10.0	14.0	60.0	0.0
Vehicle Trips/Day	Heavy Trucks	0.0	4.0	10.0	14.0	60.0	0.0
85	**Total**	**85.0**	-	-	-	-	-

Table 1

Summary of Daily Emissions

45-MW Wind Energy Project

Activity	Emission Source	Daily Emissions (lb/day)								
		ROG	CO	NOx	SO2	PM10 (Exh)	PM2.5 (Exh)	PM10 (Dust)	PM2.5 (Dust)	CO2
Site Preparation	Exhaust Emissions - Nonroad Equipment	6.7	22	53	0.05	2.4	2.4	-	-	4,820
	Exhaust Emissions - Onroad Vehicles	1.8	17	2	0.04	0.03	0.03	-	-	721
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	13	1.3	-
	Subtotal	**8.5**	**39**	**55**	**0.09**	**2.4**	**2.4**	**13**	**1.3**	**5,541**
Foundation Construction / Electrical	Exhaust Emissions - Nonroad Equipment	3.3	15	27	0.027	1.4	1.4	-	-	2,530
	Exhaust Emissions - Onroad Vehicles	9.9	93	8.9	0.117	0.075	0.072	-	-	3,206
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	56	5.7	-
	Subtotal	**13**	**108**	**36**	**0.144**	**1.5**	**1.5**	**56**	**5.7**	**5,737**
Turbine Installation and Delivery	Exhaust Emissions - Nonroad Equipment	11	36	96	0.094	4.2	4.2	-	-	8,781
	Exhaust Emissions - Onroad Vehicles	7.5	71	7.7	0.108	0.077	0.075	-	-	2,607
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	46	4.6	-
	Subtotal	**18**	**107**	**104**	**0.20**	**4.3**	**4.3**	**46**	**4.6**	**11,388**
Electrical Trenching	Exhaust Emissions - Nonroad Equipment	2.6	9.7	22	0.023	1.1	1.1	-	-	2,031
	Exhaust Emissions - Onroad Vehicles	3.0	28	3.29	0.0474	0.0356	0.0348	-	-	1,071
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	19	1.9	-
	Subtotal	**5.6**	**38**	**26**	**0.070**	**1.2**	**1.2**	**19**	**1.9**	**3,101**
All Activities	Fugitive Dust Emissions - Earth Moving Activities	**-**	**-**	**-**	**-**	**-**	**-**	**75**	**11**	**-**
TOTAL		**45**	**292**	**221**	**0.51**	**9.3**	**9.3**	**208**	**24**	**25,767**

Table 2
Summary of Total Emissions
45-MW Wind Energy Project

Activity	Emission Source	Emissions (tons)									GHG Emissions (metric tons)
		ROG	CO	NO_x	SO_2	PM_{10} (Exh)	$PM_{2.5}$ (Exh)	PM_{10} (Dust)	$PM_{2.5}$ (Dust)	CO_2	CO_2
Site Preparation	Exhaust Emissions - Nonroad Equipment	0.055	0.18	0.42	0.00042	0.020	0.020	-	-	39	35
	Exhaust Emissions - Onroad Vehicles	0.016	0.15	0.02	0.0003	0.0003	0.0003	-	-	6	6
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	0.1	0.01	-	-
	Subtotal	**0.071**	**0.33**	**0.45**	**0.0008**	**0.02**	**0.02**	**0.11**	**0.01**	**45**	**41**
Foundation Construction / Electrical	Exhaust Emissions - Nonroad Equipment	0.11	0.50	0.90	0.00091	0.046	0.046	-	-	85	77
	Exhaust Emissions - Onroad Vehicles	0.47	4.5	0.43	0.0056	0.00358	0.00346	-	-	154	140
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	2.7	0.3	-	-
	Subtotal	**0.58**	**5.0**	**1.3**	**0.0065**	**0.05**	**0.05**	**2.7**	**0.27**	**238**	**216**
Turbine Installation and Delivery	Exhaust Emissions - Nonroad Equipment	0.14	0.48	1.3	0.0012	0.054	0.054	-	-	118	107
	Exhaust Emissions - Onroad Vehicles	0.23	2.1	0.23	0.0032	0.00232	0.00226	-	-	78	71
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	1.4	0.1	-	-
	Subtotal	**0.36**	**2.6**	**1.5**	**0.0045**	**0.06**	**0.06**	**1.4**	**0.14**	**197**	**178**
Electrical Trenching	Exhaust Emissions - Nonroad Equipment	0.093	0.34	0.78	0.00080	0.039	0.039	-	-	71	64
	Exhaust Emissions - Onroad Vehicles	0.112	1.1	0.123	0.00178	0.00133	0.00130	-	-	40	36
	Fugitive Dust Emissions - Roads	-	-	-	-	-	-	0.7	0.1	-	-
	Subtotal	**0.20**	**1.4**	**0.90**	**0.0026**	**0.04**	**0.04**	**0.70**	**0.07**	**111**	**101**
All Activities	Fugitive Dust Emissions - Earth Moving Activities	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**0.2**	**-**	**-**
TOTAL		**1.2**	**9.3**	**4.2**	**0.0143**	**0.17**	**0.17**	**6**	**0.7**	**592**	**537**

Table 3
Nonroad Equipment Exhaust Emission Factors
45-MW Wind Energy Project

Equipment Type	Fuel Type	Engine Size Range	Emission Factor[a] (g/hp-hr)					
			ROG	CO	NO_x	SO_2	PM_{10}	CO_2
Rubber Tire Dozers	Diesel	0<hp≤175	0.622	2.251	4.635	0.004	0.269	335.598
	Diesel	250<hp≤500	0.458	2.198	4.059	0.003	0.173	335.598
Graders	Diesel	120<hp≤175	0.489	2.075	3.794	0.004	0.220	346.974
	Diesel	250<hp≤500	0.325	1.135	3.205	0.003	0.122	346.974
Scrapers	Diesel	175<hp≤250	0.511	1.438	4.854	0.005	0.196	409.544
	Diesel	250<hp≤500	0.464	1.928	4.361	0.004	0.176	409.544
Excavators	Diesel	175<hp≤250	0.297	0.803	3.056	0.004	0.106	324.222
Cranes	Diesel	120<hp≤175	0.369	1.486	2.834	0.003	0.164	244.589
	Diesel	175<hp≤250	0.271	0.754	2.700	0.003	0.102	244.589
	Diesel	250<hp≤500	0.247	0.898	2.406	0.002	0.093	244.589
Off-Highway Trucks	Diesel	250<hp≤500	0.297	0.897	2.762	0.003	0.104	324.222
Rough Terrain Forklifts	Diesel	50<hp≤120	0.664	2.431	4.007	0.004	0.370	341.286
	Diesel	120<hp≤175	0.449	1.996	3.523	0.004	0.205	341.286
Tractors/Loaders/Backhoes	Diesel	120<hp≤175	0.377	1.815	2.982	0.004	0.174	312.846
	Diesel	175<hp≤250	0.259	0.735	2.827	0.004	0.095	312.846
Rollers	Diesel	120<hp≤175	0.436	1.847	3.544	0.004	0.194	318.534

Notes:

a. Emission factors from Sacramento Metro AQMD Roadway Construction Model for Year 2010.

Table 4
Nonroad Equipment Exhaust Emissions
45-MW Wind Energy Project

Phase	Equipment Type	No of Units	Equipment Engine Size (hp)	Fuel Type	Daily Operation of All Units (hrs/day)	Load Factor[a]	Total Working Days per Unit (days)	Daily Emissions (lb/day)							Emissions (tons)						
								ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Site Preparation	16H Motor Grader	1	275	Diesel	9	0.61	18	2.1	6.0	9.9	0.012	0.6	0.6	1,041	0.018	0.054	0.089	0.0001	0.005	0.005	9.4
	613 Scraper	1	181	Diesel	18	0.59	18	2.2	6.1	20.6	0.020	0.8	0.8	1,736	0.020	0.055	0.185	0.0002	0.007	0.007	15.6
	623 Scraper	1	330	Diesel	9	0.56	12	1.7	7.1	16.0	0.015	0.6	0.6	1,502	0.010	0.042	0.096	0.0001	0.004	0.004	9.0
	CP563C Roller	1	153	Diesel	9	0.56	18	0.7	3.1	6.0	0.006	0.3	0.3	542	0.007	0.028	0.054	0.0001	0.003	0.003	4.9
	Subtotal							**6.67**	**22.3**	**52.5**	**0.052**	**2.39**	**2.39**	**4,820**	**0.05**	**0.2**	**0.4**	**0.0004**	**0.02**	**0.02**	**39**
Foundation Construction / Electrical	65 Ton Rough Terrain Crane	1	152	Diesel	5	0.43	20	0.3	1.1	2.0	0.002	0.1	0.1	176	0.003	0.011	0.020	0.00002	0.001	0.001	1.8
	330L Excavator	2	222	Diesel	16	0.07	60	0.2	0.4	1.7	0.002	0.1	0.1	178	0.005	0.013	0.050	0.0001	0.002	0.002	5.3
	966C Loader	1	140	Diesel	8	0.68	80	0.6	3.0	5.0	0.006	0.3	0.3	525	0.025	0.122	0.200	0.0002	0.012	0.012	21.0
	D6H Dozer	1	275	Diesel	8	0.59	60	1.3	6.3	11.6	0.009	0.5	0.5	960	0.039	0.189	0.348	0.0003	0.015	0.015	28.8
	CAT Forklists	2	153	Diesel	20	0.3	80	0.9	4.0	7.1	0.008	0.4	0.4	691	0.036	0.162	0.285	0.0003	0.017	0.017	27.6
	Subtotal							**3.28**	**14.9**	**27.5**	**0.027**	**1.38**	**1.38**	**2,530**	**0.11**	**0.5**	**0.9**	**0.0009**	**0.05**	**0.05**	**85**
Turbine Installation and Delivery	75 Ton Rough Terrain Crane	2	250	Diesel	18	0.43	14	1.2	3.2	11.5	0.012	0.4	0.4	1,043	0.008	0.023	0.081	0.0001	0.003	0.003	7.3
	90 Ton Rough Terrain Crane	5	250	Diesel	40	0.43	14	2.6	7.1	25.6	0.026	1.0	1.0	2,319	0.018	0.050	0.179	0.0002	0.007	0.007	16.2
	Manitowoc 777 Crane	2	330	Diesel	11	0.43	55	0.9	3.1	8.3	0.008	0.3	0.3	842	0.023	0.085	0.228	0.0002	0.009	0.009	23.1
	Manitowoc 2250 Crane	2	450	Diesel	12	0.43	55	1.3	4.6	12.3	0.012	0.5	0.5	1,252	0.035	0.126	0.339	0.0003	0.013	0.013	34.4
	CAT Forklists	3	60	Diesel	60	0.03	40	0.2	0.6	1.0	0.001	0.1	0.1	81	0.003	0.012	0.019	0.00002	0.002	0.002	1.6
	14G Motor Grader	2	165	Diesel	10	0.61	20	1.1	4.6	8.4	0.009	0.5	0.5	770	0.011	0.046	0.084	0.0001	0.005	0.005	7.7
	D6H Dozer	2	140	Diesel	20	0.59	20	2.3	8.2	16.9	0.014	1.0	1.0	1,222	0.023	0.082	0.169	0.0001	0.010	0.010	12.2
	LR 1400 Crane	2	450	Diesel	12	0.43	25	1.3	4.6	12.3	0.012	0.5	0.5	1,252	0.016	0.057	0.154	0.0002	0.006	0.006	15.7
	Subtotal							**10.61**	**36.0**	**96.3**	**0.094**	**4.23**	**4.23**	**8,781**	**0.14**	**0.5**	**1.3**	**0.0012**	**0.05**	**0.05**	**118**
Electrical Trenching	14G Motor Grader	2	165	Diesel	9	0.61	70	1.0	4.1	7.6	0.008	0.4	0.4	693	0.034	0.145	0.265	0.0003	0.015	0.015	24.3
	D6H LGP Dozer	1	140	Diesel	9	0.59	70	1.0	3.7	7.6	0.006	0.4	0.4	550	0.036	0.129	0.266	0.0002	0.015	0.015	19.3
	966C Loader	1	210	Diesel	8	0.68	70	0.7	1.9	7.1	0.009	0.2	0.2	788	0.023	0.065	0.249	0.0003	0.008	0.008	27.6
	Subtotal							**2.65**	**9.7**	**22.3**	**0.023**	**1.12**	**1.12**	**2,031**	**0.09**	**0.3**	**0.8**	**0.001**	**0.04**	**0.04**	**71**
TOTAL								**23.21**	**82.94**	**199**	**0.20**	**9.12**	**9.12**	**18,162**	**0.4**	**1.5**	**3.4**	**0.003**	**0.2**	**0.2**	**312.81**

Table 5
Onroad Vehicle Activity
45-MW Wind Energy Project

Activity	Vehicle	No. of Units[a]	Round Trips per Day	Travel Distance per Roundtrip		Total Working Days per Unit	VMT per Day			Total VMT for Construction Period		
				Paved Roads	Unpaved Roads		Paved Roads	Unpaved Roads	Total	Paved Roads	Unpaved Roads	Total
Site Preparation	Trucks	2	2	14	2	18	56	8	64	1,008	144	1,152
	Diesel Vehicle - Subtotal						**56**	**8**	**64**	**1,008**	**144**	**1,152**
	Worker Vehicles	9	1	58	2	18	522	18	540	9,396	324	9,720
	Gasoline Vehicle - Subtotal						**522**	**18**	**540**	**9,396**	**324**	**9,720**
	Total						**578**	**26**	**604**	**10,404**	**468**	**10,872**
Foundation Construction / Electrical	Trucks	3	2	14	2	96	84	12	96	8,064	1,152	9,216
	Diesel Vehicle - Subtotal						**84**	**12**	**96**	**8,064**	**1,152**	**9,216**
	Worker Vehicles	50	1	58	2	96	2,900	100	3,000	278,400	9,600	288,000
	Gasoline Vehicle - Subtotal						**2,900**	**100**	**3,000**	**278,400**	**9,600**	**288,000**
	Total						**2,984**	**112**	**3,096**	**286,464**	**10,752**	**297,216**
Turbine Installation and Delivery	Trucks	4	2	14	2	60	112	16	128	6,720	960	7,680
	Diesel Vehicle - Subtotal						**112**	**16**	**128**	**6,720**	**960**	**7,680**
	Worker Vehicles	38	1	58	2	60	2,204	76	2,280	132,240	4,560	136,800
	Gasoline Vehicle - Subtotal						**2,204**	**76**	**2,280**	**132,240**	**4,560**	**136,800**
	Total						**2,316**	**92**	**2,408**	**138,960**	**5,520**	**144,480**
Electrical Trenching	Trucks	2	2	14	2	75	56	8	64	4,200	600	4,800
	Diesel Vehicle - Subtotal						**56**	**8**	**64**	**4,200**	**600**	**4,800**
	Worker Vehicles	15	1	58	2	75	870	30	900	65,250	2,250	67,500
	Gasoline Vehicle - Subtotal						**870**	**30**	**900**	**65,250**	**2,250**	**67,500**
	Total						**926**	**38**	**964**	**69,450**	**2,850**	**72,300**

Notes:
a. It was assumed that the number of worker vehicles was based on a 50% carpool/vanpool rate for workers.

Table 6
Onroad Vehicle Exhaust Emission Factors
45-MW Wind Energy Project

Equipment Type	Fuel Type	Emission Factor[a] (g/VMT)						
		NO_x	ROG	CO	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Gasoline Vehicles	Gasoline	1.09	1.49	14.05	0.0127	0.0059	0.0055	440
Diesel Vehicles	Diesel	8.06	0.28	1.10	0.158	0.17	0.17	1,400

Notes:

a. Emission factors for gasoline worker vehicles from "Emission Facts: Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks (EPA420-F-05-22, EPA 2005). It was assumed that the vehicle make-up included 50% cars and 50% light-duty trucks/SUVs. SO2 emission factor calculated from gasoline consumption rate and a sulfur content of 80 ppm.

b. Emission factors for diesel worker and delivery vehicles (except SO2 and CO2) from "Assessing the Effects of Freight Movement on Air Quality at the National and Regional Level- Final Report" (U.S. Federal Highway Administration 2005).

c. CO_2 and SO_2 emission factors for diesel worker and delivery vehicles from "Greenhouse Gas Protocol - Corporate Accounting and Reporting Standard / Mobile Guide" (World Resources Institute/World Business Council for Sustainable Development 2005). SO2 emission factor calculated from diesel consumption rate and a sulfur content of 348 ppm.

d. HAP emission factors based on fractions presented in "Documentation for the Oonroad National Emissions Inventory (NEI) for Base Years 1970-2002" (EPA 2004).

Table 7
Onroad Vehicle Exhaust Emissions
45-MW Wind Energy Project

Activity	Description	Fuel Type	Daily Mileage (VMT)	Total Mileage (VMT)	Emissions (lbs/day)							Emissions (tons)						
					ROG	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	CO_2	ROG	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	CO_2
Site Preparation	Onroad Vehicles	Gasoline	540	9,720	1.77	16.73	1.29	0.02	0.01	0.01	523.81	0.02	0.2	0.01	0.0001	0.0001	0.0001	5
	Onroad Vehicles	Diesel	64	1,152	0.04	0.16	1.14	0.02	0.02	0.02	197.53	0.000	0.001	0.01	0.0002	0.0002	0.0002	2
	Total				**1.81**	**16.9**	**2.43**	**0.037**	**0.031**	**0.030**	**721**	**0.02**	**0.2**	**0.02**	**0.000**	**0.0003**	**0.0003**	**6**
Foundation Construction / Electrical	Onroad Vehicles	Gasoline	3,000	288,000	9.82	92.92	7.18	0.08	0.039	0.036	2910.05	0.47	4.5	0.34	0.0040	0.0019	0.0017	140
	Onroad Vehicles	Diesel	96	9,216	0.06	0.23	1.71	0.03	0.036	0.036	296.30	0.003	0.01	0.1	0.0016	0.0017	0.0017	14
	Total				**9.88**	**93.2**	**8.9**	**0.1171**	**0.075**	**0.072**	**3206**	**0.47**	**4.5**	**0.43**	**0.0056**	**0.0036**	**0.0035**	**154**
Turbine Installation and Delivery	Onroad Vehicles	Gasoline	2,280	136,800	7.46	70.62	5.45	0.06	0.029	0.027	2211.64	0.224	2.12	0.164	0.0019	0.0009	0.0008	66
	Onroad Vehicles	Diesel	128	7,680	0.08	0.31	2.27	0.04	0.048	0.048	395.06	0.0024	0.009	0.07	0.0013	0.0014	0.0014	12
	Total				**7.543**	**70.93**	**7.73**	**0.1082**	**0.077**	**0.075**	**2607**	**0.226**	**2.13**	**0.23**	**0.0032**	**0.0023**	**0.0023**	**78**
Electrical Trenching	Onroad Vehicles	Gasoline	900	67,500	2.95	27.88	2.15	0.03	0.012	0.011	873.02	0.11	1.0	0.08	0.0009	0.0004	0.0004	33
	Onroad Vehicles	Diesel	64	4,800	0.04	0.16	1.14	0.02	0.024	0.024	197.53	0.001	0.006	0.04	0.0008	0.0009	0.0009	7
	Total				**2.99**	**28.0**	**3.29**	**0.047**	**0.036**	**0.035**	**1071**	**0.11**	**1.1**	**0.12**	**0.0018**	**0.0013**	**0.0013**	**40**

Table 8
Road Fugitive Dust Emissions from Onroad Vehicles
45-MW Wind Energy Project

Activity	Road Type	Daily Mileage (VMT)	Total Mileage (VMT)	Emission Factor[a] (lb/VMT)		Uncontrolled Daily Emissions (lb/day)		Uncontrolled Emissions (tons)		Controlled Daily Emissions (lb/day)		Controlled Emissions (tons)	
				PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Site Preparation	Paved Roads	578	10,404	0.0068	0.0007	4.0	0.43	0.036	0.0038	2.0	0.21	0.018	0.0019
	Unpaved	26	468	0.82	0.082	21	2.1	0.19	0.019	11	1.07	0.10	0.010
	Subtotal					**25**	**2.6**	**0.23**	**0.023**	**13**	**1**	**0.11**	**0.012**
Foundation Construction / Electrical	Paved Roads	2,984	286,464	0.0068	0.0007	20.43	2.20	0.98	0.11	10.2	1.10	0.490	0.053
	Unpaved	112	10,752	0.82	0.082	92	9.2	4.4	0.44	46	4.6	2.2	0.22
	Subtotal					**112**	**11.4**	**5.4**	**0.55**	**56**	**5.7**	**2.7**	**0.273**
Turbine Installation and Delivery	Paved Roads	2,316	138,960	0.0068	0.0007	15.9	1.71	0.48	0.051	7.9	0.85	0.24	0.026
	Unpaved	92	5,520	0.82	0.082	75	8	2.3	0.23	38	3.8	1.1	0.11
	Subtotal					**91**	**9**	**2.7**	**0.28**	**46**	**4.6**	**1.4**	**0.14**
Electrical Trenching	Paved Roads	926	69,450	0.0068	0.0007	6.3	0.68	0.238	0.0256	3.17	0.34	0.12	0.013
	Unpaved	38	2,850	0.82	0.082	31	3.1	1.17	0.117	16	1.6	0.58	0.058
	Subtotal					**38**	**3.8**	**1.41**	**0.142**	**19**	**1.9**	**0.70**	**0.071**

Notes:
a. See emission factor derivation table below.

Paved Roads - Emission Factor Derivation Table

$E = (k(sL/2)^{0.65}(W/3)^{1.5}-C)$ AP-42 Section 13.2.1 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k = particle size multiplier
sL = road surface silt loading (g/m^2)
W = average vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	lb/VMT	0.016	0.0024	Table 13.2-1.1
Silt Loading, sL	g/m^2	0.6	0.6	Table 13.2.1-3
Emission factor, C	lb/VMT	0.00047	0.00036	Table 13.2.1-2

Unpaved Roads - Emission Factor Derivation

$E = k(s/12)^a(W/3)^b$ AP-42 Section 13.2.2 (11/06 version)

Controlled E = E * ((100-CE)/100)

where:

E = particulate emission factor (lb/VMT)
k, a, b = empirical constants for industrial roads
s = surface material silt content (%)
W = average vehicle weight (tons)

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	**tons**	4.25	4.25	Assumption
Constant, k	lb/VMT	1.8	0.18	Table 13.2.2-2 (worst case)
Constant, a		1	1	Table 13.2.2-2 (worst case)
Constant, b		0.45	0.45	Table 13.2.2-2 (worst case)
Silt content, s	%	8.5	8.5	Table 13.2..2-1 (construction sites)
Control Efficiency, CE	**%**	45	45	Assumption based on regular watering

Table 9
Fugitve Dust Emissions from Earth Moving Activities
45-MW Wind Energy Project

Construction Activity	Disturbance[a] (acres/day)	Duration of Activity (months)	Controlled Emission Factor[a] (ton/acre/month)		Controlled Daily Emissions[c] (lbs/day)		Controlled Emissions (tons)	
			PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
All Activities	5	6	0.2	0.0	450.0	63.0	1.4	0.2

Notes:
a. Area of disturbance is listed as average disturbance area for a typical work day, considering 2 acres/day and 3 additional acres of disturbance for other activities
b. See emisison factor derivation table below

Emission Factor Derivation Table

Parameter	Units	TSP[1]	PM_{10}[(2)]	$PM_{2.5}$[(3)]
Uncontrolled Emission Factor[1] (based on 30 days/month)	ton/acre/month	1.2	0.9	0.126
Controlled Emission Factor[5] (based on 24 days/month)	ton/acre/month	0.3	0.225	0.0315

Notes:
1. Emission factor from AP-42 Section 13.2.3 for TSP.
2. PM_{10} emission factor calculated by multiplying TSP emission factor by 0.75 (AP-42 Section 11.9, Table 11.9-1)
3. $PM_{2.5}$ emission factor calculated by multiplying TSP emission factor by 0.105 (AP-42 Section 11.9, Table 11.9-1)
4. Calculated by multiplying 30-day emission factor by 0.8 (24 days/ 30 days).
5. Conservatively assumed dust 75% control factor based on maximum control measures. Actual dust control effectiveness TBD based on consultation with local APCD (may be

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Appendix B
Emission Calculations for Construction Activities
West Chocolate Mountains Solar PV Development

Table No.	Table Description
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Table B1-b	Total Construction Emissions - Phase II (Additional 25 MW)
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Table B1-a

Total Construction Emissions - Phase I (25 MW)

West Chocolate Mountains Solar PV Development

Emission Type	Source	Emissions (tons)						GHG Emissions (metric tons)
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Exhaust Emissions	Non Road Equipment	0.57	2.29	4.90	0.01	0.25	0.25	537
	On Road Vehicles	0.09	0.36	1.17	0.00	0.06	0.05	117
Fugitive Dust Emissions	Construction Activities	-	-	-	-	0.54	0.08	-
	Roads (Site and Off-Site)	-	-	-	-	5.80	0.64	-
Subtotal		**0.66**	**2.65**	**6.06**	**0.01**	**6.64**	**1.02**	**653**

Table B1-b

Total Construction Emissions - Phase II (Additional 25 MW)

West Chocolate Mountains Solar PV Development

Emission Type	Source	Emissions (tons)						GHG Emissions (metric tons)
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Exhaust Emissions	Non Road Equipment	0.57	2.29	4.90	0.01	0.25	0.25	537
	On Road Vehicles	0.09	0.36	1.17	0.001	0.06	0.05	117
Fugitive Dust Emissions	Construction Activities	-	-	-	-	0.74	0.08	-
	Roads (Site and Off-Site)	-	-	-	-	5.80	0.10	-
Subtotal		**0.66**	**2.65**	**6.06**	**0.01**	**6.84**	**0.48**	**653**

Table B2-a

Summary of Daily Construction Emissions - Phase I

West Chocolate Mountains Solar PV Development

Emission Type	Source	Emissions (lbs/day)							
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Exhaust Emissions	Non Road Equipment	7.8	30.2	63.0	0.1	3.5	3.5	6,886	0.7
	On Road Vehicles	0.8	3.0	9.7	0.01	0.5	0.4	1,070	0.04
Fugitive Dust Emissions	Construction Activities	-	-	-	-	43	6	-	-
	Roads (Site and Off-Site)	-	-	-	-	48	5	-	-
Subtotal		**9**	**33**	**73**	**0.1**	**95**	**15**	**7,957**	**1**

Table B2-b

Summary of Daily Construction Emissions - Phase II

West Chocolate Mountains Solar PV Development

Emission Type	Source	Emissions (lbs/day)							
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Exhaust Emissions	Non Road Equipment	7.8	30.2	63.0	0.1	3.5	3.5	6,886	0.7
	On Road Vehicles	0.8	3.0	9.7	0.01	0.5	0.4	1,070	0.04
Fugitive Dust Emissions	Construction Activities	-	-	-	-	58	8	-	-
	Roads (Site and Off-Site)	-	-	-	-	48	5	-	-
Subtotal		**9**	**33**	**73**	**0.1**	**110**	**17**	**7,957**	**1**

Table B3
Non-Road Diesel Equipment Exhaust Emission Factors
West Chocolate Mountains Solar PV Development

Equipment	Maximum Operating Range (hp)	Composite Emission Factor (lb/hr)						
		ROG	CO	NO_x	SO_2	PM	CO_2	CH_4
Vibratory Post Driver / Drill Rig	Composite	0.1052	0.5146	1.1331	0.0017	0.0498	165	0.0095
Crawler Tractors	Composite	0.1861	0.6409	1.3854	0.0013	0.0854	114	0.0168
Excavators	Composite	0.1483	0.5581	1.1502	0.0013	0.0638	120	0.0134
Forklifts	Composite	0.0686	0.2319	0.5161	0.0006	0.0281	54.4	0.0062
Generator Set	15	0.0172	0.0726	0.1154	0.0002	0.0069	10.2	0.0016
Graders	Composite	0.1723	0.6314	1.4338	0.0015	0.0753	133	0.0155
Rollers	Composite	0.1176	0.4212	0.7749	0.0008	0.0547	67.1	0.0106
Scrapers	Composite	0.3202	1.2424	2.9078	0.0027	0.1256	262	0.0289
Tractors/Loaders/Backhoes	Composite	0.1021	0.3930	0.6747	0.0008	0.0521	66.8	0.0092
Plate Compactor	Composite	0.0050	0.0263	0.0317	0.0001	0.0015	4.3	0.0005

Source: South Coast Air Quality Management District (SCAQMD). 2008. Off-road Mobile Source Emission Factors (Scenario Years 2007 – 2025).

Notes:

Composite emission factors have horsepower rating and load factors already built into the emission factors. SCAQMD recommends using composite factors if the CEQA practitioner does not know these two parameters when calculating off-road mobile source emissions

Table 4-A
Total Emissions for Diesel Non-Road Equipment - Phase I
West Chocolate Mountains Solar PV Development

Construction Phase	Equipment Type	Equipment Engine Size (hp) [a]	Fuel Type	Total Hourly Usage for All Units (hrs)	Criteria PollutantsTotal Emissions (tons)					GHG Total Emissions (metric tons)		
					ROG	CO	NO_x	SO_2	PM	CO_2	CH_4	CO_2e
All Construction Activities	Vibratory Post Driver	100-175	Diesel	4,050	0.213	1.042	2.295	0.004	0.101	302.8	0.0	303.2
	Crawler Tractors/Dozer	100-175	Diesel	500	0.047	0.160	0.346	0.000	0.021	25.9	0.0	25.9
	Excavators	175-300	Diesel	200	0.015	0.056	0.115	0.000	0.006	10.8	0.0	10.9
	Forklifts/Aerial Lifts/ Booms	50-100	Diesel	6,000	0.206	0.696	1.548	0.002	0.084	148.0	0.0	148.4
	Generator/Compressor	5-15	Diesel	4,000	0.034	0.145	0.231	0.000	0.014	18.5	0.0	18.6
	Graders	175-300	Diesel	80	0.007	0.025	0.057	0.000	0.003	4.8	0.0	4.8
	Rollers/Compactors	100-175	Diesel	500	0.029	0.105	0.194	0.000	0.014	15.2	0.0	15.3
	Scrapers	175-300	Diesel	40	0.006	0.025	0.058	0.000	0.003	4.8	0.0	4.8
	Tractors/Loaders/Backhoes	100-175	Diesel	160	0.008	0.031	0.054	0.000	0.004	4.8	0.0	4.9
	Vibratory Plate (hand held)	10 -- 15	Diesel	40	0.000	0.001	0.001	0.000	0.000	0.1	0.0	0.1
	TOTAL				**0.566**	**2.286**	**4.899**	**0.006**	**0.250**	**536**	**0.046**	**537**

Notes:
(a) Composite emission factors recommended by the South Coast Air Management District were used per equipment, except for Generator/Compressor (maximum hp 15).

Table 4-B
Total Emissions for Diesel Non-Road Equipment - Phase II
West Chocolate Mountains Solar PV Development

Construction Phase	Equipment Type	Equipment Engine Size (hp) [a]	Fuel Type	Total Hourly Usage for All Units (hrs)	Criteria PollutantsTotal Emissions (tons)					GHG Total Emissions (metric tons)		
					ROG	CO	NO_x	SO_2	PM	CO_2	CH_4	CO_2e
All Construction Activities	Vibratory Post Driver	100-175	Diesel	4,050	0.213	1.042	2.295	0.004	0.101	303	0.0	303
	Crawler Tractors/Dozer	100-175	Diesel	500	0.047	0.160	0.346	0.000	0.021	26	0.0	26
	Excavators	175-300	Diesel	200	0.015	0.056	0.115	0.000	0.006	11	0.0	11
	Forklifts/Aerial Lifts/ Booms	50-100	Diesel	6,000	0.206	0.696	1.548	0.002	0.084	148	0.0	148
	Generator/Compressor	5 -- 15	Diesel	4,000	0.034	0.145	0.231	0.000	0.014	19	0.0	19
	Graders	175-300	Diesel	80	0.007	0.025	0.057	0.000	0.003	5	0.0	5
	Rollers/Compactors	100-175	Diesel	500	0.029	0.105	0.194	0.000	0.014	15	0.0	15
	Scrapers	175-300	Diesel	40	0.006	0.025	0.058	0.000	0.003	5	0.0	5
	Tractors/Loaders/Backhoes	100-175	Diesel	160	0.008	0.031	0.054	0.000	0.004	5	0.0	5
	Vibratory Plate (hand held)	10-15	Diesel	40	0.000	0.001	0.001	0.000	0.000	0	0.0	0
	TOTAL				**0.57**	**2.29**	**4.90**	**0.01**	**0.25**	**536**	**0.046**	**537**

Notes:
(a) Composite emission factors recommended by the South Coast Air Management District were used per equipment, except for Generator/Compressor (maximum hp 15).

Table 5-A
Daily Emissions for Diesel Non-Road Equipment - Phase I
West Chocolate Mountains Solar PV Development

Construction Phase	Equipment Type	Equipment Engine Size (hp) [a]	Fuel Type	Total Hourly Usage for All Units (hrs)	Estimated daily usage [b] (hrs/day)	Criteria PollutantsTotal Emissions (lbs/day)					GHG Total Emissions (lbs/day)	
						ROG	CO	NO_x	SO_2	PM	CO_2	CH_4
All Construction Activities	Vibratory Post Driver	100-175	Diesel	4,050	17	1.776	8.684	19.122	0.029	0.841	2782	0.160
	Crawler Tractors/Dozer	100-175	Diesel	500	2	0.388	1.335	2.886	0.003	0.178	238	0.035
	Excavators	175-300	Diesel	200	1	0.124	0.465	0.958	0.001	0.053	100	0.011
	Forklifts/Aerial Lifts/ Booms	50-100	Diesel	6,000	25	1.714	5.798	12.902	0.015	0.702	1360	0.155
	Generator/Compressor	5 -- 15	Diesel	4,000	17	0.287	1.209	1.923	0.003	0.115	170	0.026
	Graders	175-300	Diesel	80	3	0.551	2.020	4.588	0.005	0.241	425	0.050
	Rollers/Compactors	100-175	Diesel	500	20	2.353	8.424	15.497	0.015	1.094	1341	0.212
	Scrapers	175-300	Diesel	40	2	0.512	1.988	4.653	0.004	0.201	420	0.046
	Tractors/Loaders/Backhoes	100-175	Diesel	160	1	0.068	0.262	0.450	0.001	0.035	45	0.006
	Vibratory Plate (hand held)	10 -- 15	Diesel	40	2	0.008	0.042	0.051	0.000	0.002	7	0.001
	TOTAL					**7.8**	**30.2**	**63.0**	**0.1**	**3.5**	**6,886**	**0.702**

Notes:
(a) Composite emission factors recommended by the South Coast Air Management District were used per equipment, except for Generator/Compressor (maximum hp 15).
(b) Daily usage is estimated per a composite number of equipment and based on a 240 days of total construction period.
Exception on daily usage assumption includes graders, scrapers, vibratory plates and roller/compactors, since the grading activities are intended to have a 25-day duration.

Table 5-B
Daily Emissions for Diesel Non-Road Equipment - Phase II
West Chocolate Mountains Solar PV Development

Construction Phase	Equipment Type	Equipment Engine Size (hp) [a]	Fuel Type	Total Hourly Usage for All Units (hrs)	Estimated daily usage [b] (hrs/day)	Criteria PollutantsTotal Emissions (lbs/day)					GHG Total Emissions (lbs/day)	
						ROG	CO	NO_x	SO_2	PM	CO_2	CH_4
All Construction Activities	Vibratory Post Driver	100-175	Diesel	4,050	17	1.776	8.684	19.122	0.029	0.841	2781.90	0.160
	Crawler Tractors/Dozer	100-175	Diesel	500	2	0.388	1.335	2.886	0.003	0.178	237.54	0.035
	Excavators	175-300	Diesel	200	1	0.124	0.465	0.958	0.001	0.053	99.65	0.011
	Forklifts/Aerial Lifts/ Booms	50-100	Diesel	6,000	25	1.714	5.798	12.902	0.015	0.702	1359.89	0.155
	Generator/Compressor	5-15	Diesel	4,000	17	0.287	1.209	1.923	0.003	0.115	170.13	0.026
	Graders	175-300	Diesel	80	3	0.551	2.020	4.588	0.005	0.241	424.78	0.050
	Rollers/Compactors	100-175	Diesel	500	20	2.353	8.424	15.497	0.015	1.094	1341.05	0.212
	Scrapers	175-300	Diesel	40	2	0.512	1.988	4.653	0.004	0.201	419.998	0.046
	Tractors/Loaders/Backhoes	100-175	Diesel	160	1	0.068	0.262	0.450	0.001	0.035	44.54	0.006
	Vibratory Plate (hand held)	10-15	Diesel	40	2	0.008	0.042	0.051	0.000	0.002	6.902	0.001
	TOTAL					**7.8**	**30.2**	**63.0**	**0.1**	**3.5**	**6,886**	**0.702**

Notes: Construction of Phase II is assumed to have the same duration and equipment/vehicle list as Phase I
(a) Composite emission factors recommended by the South Coast Air Management District were used per equipment, except for Generator/Compressor (maximum hp 15).
(b) Daily usage is estimated per a composite number of equipment and based on a 240 days of total construction period, except for gradind equipment (25 days).
Exception on daily usage assumption includes graders, scrapers, vibratory plates and roller/compactors.

Table 6

On-Road Vehicle Usage Phases I and II

West Chocolate Mountains Solar PV Development

Phase I

Vehicle Type	Construction Phase	Vehicle Description	Vehicle Class	Total Working Hours	Total Working Days	Working hours per day	Estimated speed (mph)	Total Daily VMT All Units (VMT/day)			Total Overall VMT of All Units (VMT)		
								Unpaved Roads	Paved Roads	TOTAL	Unpaved Roads	Paved Roads	TOTAL
Heavy Duty Diesel Truck	All	Dump Truck	HDDV6	120	240	0.5	25	2.5	10	13	600	2,400	3,000
		Concrete Truck	HDDV6	120	240	0.5	25	2.5	10	13	600	2,400	3,000
		Tender Truck	HDDV6	120	240	0.5	25	2.5	10	13	600	2,400	3,000
		Highway Tractor	HDDV6	80	240	0.3	25	1.7	7	8	400	1,600	2,000
		Flatbed Truck	HDDV3	1000	240	4.2	25	20.8	83	104	5,000	20,000	25,000
		Water Truck	HDDV6	1000	240	4.2	25	20.8	83	104	5,000	20,000	25,000
	Subtotal	-		-	-	-	-	**51**	**203**	**254**	**12,200**	**48,800**	**61,000**

Phase II

Vehicle Type	Construction Phase	Vehicle Description	Vehicle Class	Total Working Hours	Total Working Days	Working hours per day	Estimated speed (mph)	Total Daily VMT All Units (VMT/day)			Total Overall VMT of All Units (VMT)		
								Unpaved Roads	Paved Roads	TOTAL	Unpaved Roads	Paved Roads	TOTAL
Heavy Duty Diesel Truck	All	Dump Truck	HDDV6	120	240	0.5	25	2.5	10	13	600	2,400	3,000
		Concrete Truck	HDDV6	120	240	0.5	25	2.5	10	13	600	2,400	3,000
		Tender Truck	HDDV6	120	240	0.5	25	2.5	10	13	600	2,400	3,000
		Highway Tractor	HDDV6	80	240	0.3	25	1.7	7	8	400	1,600	2,000
		Flatbed Truck	HDDV3	1000	240	4.2	25	20.8	83	104	5,000	20,000	25,000
		Water Truck	HDDV6	1000	240	4.2	25	20.8	83	104	5,000	20,000	25,000
	Subtotal	-		-	-	-	-	**51**	**203**	**254**	**12,200**	**48,800**	**61,000**

Notes: Construction of Phase II is assumed to have the same duration and equipment/vehicle list as Phase I

Table 7
On-Road Vehicle Exhaust Emission Factors
West Chocolate Mountains Solar PV Development

Equipment Type	Emission Factor[a] (pounds/VMT)							
	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH_4
Heavy Duty Diesel Trucks	0.003042	0.011955	0.038221	0.000041	0.001831	0.001601	4.211206	0.000142
Light Duty Trucks	0.002590	0.01844	0.02062	0.0000270	0.0007512	0.0006243	2.732	0.0001258
Gasoline Passenger Vehicles	0.0009140	0.00826	0.0009181	0.00001077	0.00008698	0.00005478	1.096	0.00008146
ATVs	0.0046270	0.10146	0.0009048	0.00010582	0.00014550	0.00014550	0.517	0.00000000

Notes:

a. Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks. SCAQMD (Scenario Year: 2010).

Table 8-A

Total and Daily Exhaust Emissions for On Road Vehicles - Phase I

West Chocolate Mountains Solar PV Development

Total Emissions

Vehicle Type	Total Overall Miles Travelled (VMT)	Total Emissions (tons)						Total Emissions (metric tons)	
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Heavy Duty Diesel Trucks	61,000	0.09	0.36	1.17	0.00	0.06	0.05	117	0
Total	**-**	**0.09**	**0.36**	**1.17**	**0.00**	**0.06**	**0.05**	**117**	**0**

Daily Emissions

Vehicle Type	Total Overall Miles Travelled (VMT)	Total Emissions (lbs/day)							
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Heavy Duty Diesel Trucks	61,000	1	3	10	0.01	0.5	0.4	1070	0.04
Total	**-**	**1**	**3**	**10**	**0.01**	**0.5**	**0.4**	**1070**	**0.04**

Table 8-B
Total and Daily Exhaust Emissions for On Road Vehicles - Phase II
West Chocolate Mountains Solar PV Development

Total Emissions

Vehicle Type	Total Overall Miles Travelled (VMT)	Total Emissions (tons)						Total Emissions (metric tons)	
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Heavy Duty Diesel Trucks	61,000	0.09	0.36	1.17	0.00	0.06	0.05	117	0
Total	**-**	**0.09**	**0.36**	**1.17**	**0.00**	**0.06**	**0.05**	**117**	**0**

Daily Emissions

Vehicle Type	Total Overall Miles Travelled (VMT)	Total Emissions (lbs/day)							
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4
Heavy Duty Diesel Trucks	61,000	1	3	10	0	0	0	1070	0
Total	**-**	**1**	**3**	**10**	**0**	**0**	**0**	**1070**	**0**

Notes: Construction of Phase II is assumed to have the same duration and equipment/vehicle list as Phase I

Table 9-A
Fugitve Dust Emissions - Construction Site - Phase I
West Chocolate Mountains Solar PV Development

Construction Activity	Average Daily Disturbance (acres)	Duration of Activity (months)	Emission Factor[a] (ton/acre/month)		Emissions (tons)		Daily Emissions (lbs/day)	
			PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Site Clearing and Grading	7.2	0.83	0.090	0.0126	0.54	0.08	43	6
Access Roads	1.4	0.17	0.090	0.0126	0.02	0.00	8.4	1.2
Switchyard	0.0006	0.17	0.090	0.0126	0.00	0.00	0.0	0.0
Underground Power Line	0.1667	1	0.090	0.0126	0.02	0.00	1.0	0.1
Control/Maintenance Building	0.0001	4	0.090	0.0126	0.00	0.00	0.00	0.00
Parking / Laydown Area	0.1	0.17	0.090	0.0126	0.00	0.00	0.00	0.00
Total	**-**	**-**	**-**	**-**	**0.58**	**0.08**	**53**	**7**

Notes:
a. See emission factor derivation table below.
b. Total site area for Phase I: 516 acres. Total duration of grading: 25 days.

Emission Factor Derivation Table

Parameter	Units	TSP[1]	PM_{10}[(2)]	$PM_{2.5}$[(3)]
Uncontrolled Emission Factor[1] (based on 30 days/month)	ton/acre/month	0.2	0.15	0.021
Controlled Emission Factor[5] (based on 24 days/month)	ton/acre/month	0.12	0.090	0.0126

Notes:
1. Emission factor from AP-42 Section 13.2.3 for TSP.
2. PM_{10} emission factor calculated by multiplying TSP emission factor by 0.75 (AP-42 Section 11.9, Table 11.9-1)
3. $PM_{2.5}$ emission factor calculated by multiplying TSP emission factor by 0.105 (AP-42 Section 11.9, Table 11.9-1)
4. Calculated by multiplying 30-day emission factor by 0.8 (24 days/ 30 days).
4. Assume dust 40% duct control factor based on as-needed watering. Does not include any control for winter conditions.

Table 9-B
Fugitve Dust Emissions - Construction Site - Phase II
West Chocolate Mountains Solar PV Development

Construction Activity	Average Daily Disturbance (acres)	Duration of Activity (months)	Emission Factor[a] (ton/acre/month)		Emissions (tons)		Daily Emissions (lbs/day)	
			PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Site Clearing and Grading	9.6	0.83	0.090	0.0126	0.72	0.10	58	8
Switchyard	0.0006	0.17	0.090	0.0126	0.00	0.00	0.0	0.0
Underground Power Line	0.1667	1	0.090	0.0126	0.02	0.00	1.0	0.1
Parking / Laydown Area	0.1	0.17	0.090	0.0126	0.00	0.00	0.00	0.00
Total	**-**	**-**	**-**	**-**	**0.74**	**0.10**	**59**	**8**

Notes:
a. See emission factor derivation table below.
b. Total solar array area for Phase II: 140 acres (Per POD description). Total duration of grading: 25 days.

Emission Factor Derivation Table

Parameter	Units	TSP[1]	PM_{10}[(2)]	$PM_{2.5}$[(3)]
Uncontrolled Emission Factor[1] (based on 30 days/month)	ton/acre/month	0.2	0.15	0.021
Controlled Emission Factor[5] (based on 24 days/month)	ton/acre/month	0.12	0.090	0.0126

Notes:
1. Emission factor from AP-42 Section 13.2.3 for TSP.
2. PM_{10} emission factor calculated by multiplying TSP emission factor by 0.75 (AP-42 Section 11.9, Table 11.9-1)
3. $PM_{2.5}$ emission factor calculated by multiplying TSP emission factor by 0.105 (AP-42 Section 11.9, Table 11.9-1)
4. Calculated by multiplying 30-day emission factor by 0.8 (24 days/ 30 days).
4. Assume dust 40% duct control factor based on as-needed watering. Does not include any control for winter conditions (frozen ground)

Table 10
Fugitive Dust Emission Factors - Roads

Unpaved Roads - Emission Factor Derivation

$E = k(s/12)^a(W/3)^b$ AP-42 Section 13.2.2 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k, a, b = empirical constants for industrial roads
s = surface material silt content (%)
W = average vehicle weight (tons)

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	**tons**	12	12	Assumption
Constant, k	lb/VMT	1.5	0.15	Table 13.2.2-2 (worst case)
Constant, a		0.9	0.9	Table 13.2.2-2 (worst case)
Constant, b		0.45	0.45	Table 13.2.2-2 (worst case)
Silt content, s	%	8.5	8.5	Table 13.2..2-1 (construction sites)
Uncontrolled Emission factor, E	**lb/VMT**	**2.05**	**0.205**	**Calculation**
Control Efficiency for Watering	%	0.65	0.65	Assumption
Controlled Emission factor, E	**lb/VMT**	**0.72**	**0.072**	**Calculation**

Paved Roads - Emission Factor Derivation Table

$E = (k(sL/2)^{0.65}(W/3)^{1.5}-C)$ AP-42 Section 13.2.1 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k = particle size multiplier
sL = road surface silt loading (g/m^2)
W = average vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	tons	12	12	Assumption
k factor	lb/VMT	0.016	0.0024	Table 13.2-1.1
Silt Loading, sL	g/m^2	0.6	0.6	Table 13.2.1-3
Emission factor, C	lb/VMT	0.00047	0.00036	Table 13.2.1-2
Uncontrolled Emission factor, E	**lb/VMT**	**0.05805**	**0.008419**	**Calculation**

Table 11-A
Fugitive Dust Emissions from Road (Site and Off-Site) - Phase I

Total Emissions

			Emissions (tons)					
	Total Overall VMT (VMT)		Unpaved Roads		Paved Roads		All Roads	
Fuel Type	**Paved Roads**	**Unpaved Roads**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Heavy Duty Diesel Trucks	12,200	48,800	4.382	0.438	1.42	0.205	5.80	0.644
Total	**-**	**-**	**4.4**	**0.4**	**1.4**	**0.21**	**5.8**	**0.64**

Daily Emissions

			Emissions (lbs/day)					
	Total Overall VMT (VMT)		Unpaved Roads		Paved Roads		All Roads	
Fuel Type	**Paved Roads**	**Unpaved Roads**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Heavy Duty Diesel Trucks	12,200	48,800	36.5	3.7	11.8	1.7	48.3	5.4
Total	**-**	**-**	**36.7**	**3.7**	**11.9**	**1.7**	**48.5**	**5.4**

Table 11-B
Fugitive Dust Emissions from Road (Site and Off-Site) - Phase II

Total Emissions

			Emissions (tons)					
	Total Overall VMT (VMT)		Unpaved Roads		Paved Roads		All Roads	
Fuel Type	**Paved Roads**	**Unpaved Roads**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Heavy Duty Diesel Trucks	12,200	48,800	4.382	0.438	1.42	0.205	5.80	0.644
Total	**-**	**-**	**4.4**	**0.4**	**1.4**	**0.21**	**5.8**	**0.64**

Daily Emissions

			Emissions (lbs/day)					
	Total Overall VMT (VMT)		Unpaved Roads		Paved Roads		All Roads	
Fuel Type	**Paved Roads**	**Unpaved Roads**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**	**PM_{10}**	**$PM_{2.5}$**
Heavy Duty Diesel Trucks	12,200	48,800	36.5	3.7	11.8	1.7	48.3	5.4
Total	**-**	**-**	**36.7**	**3.7**	**11.9**	**1.7**	**48.5**	**5.4**

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SCAB Fleet Average Emission Factors (Diesel)

EF-OFFROAD

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**CO2**	**CH4**
Aerial Lifts	15	0.0104	0.0529	0.0662	0.0001	0.0037	8.7	0.0009
	25	0.0210	0.0577	0.1013	0.0001	0.0065	11.0	0.0019
	50	0.0756	0.1937	0.1984	0.0003	0.0189	19.6	0.0068
	120	0.0702	0.2501	0.4502	0.0004	0.0361	38.1	0.0063
	500	0.1506	0.5801	1.9198	0.0021	0.0598	213	0.0136
	750	0.2803	1.0486	3.5605	0.0039	0.1096	385	0.0253
Aerial Lifts Composite		0.0670	0.2093	0.3600	0.0004	0.0248	34.7	0.0060
Air Compressors	15	0.0144	0.0513	0.0838	0.0001	0.0061	7.2	0.0013
	25	0.0325	0.0847	0.1397	0.0002	0.0098	14.4	0.0029
	50	0.1163	0.2813	0.2386	0.0003	0.0265	22.3	0.0105
	120	0.1014	0.3351	0.5977	0.0006	0.0545	47.0	0.0091
	175	0.1274	0.5113	1.0082	0.0010	0.0568	88.5	0.0115
	250	0.1225	0.3413	1.3983	0.0015	0.0462	131	0.0111
	500	0.1943	0.6778	2.2062	0.0023	0.0752	232	0.0175
	750	0.3054	1.0476	3.5002	0.0036	0.1179	358	0.0276
	1000	0.5203	1.8591	6.0195	0.0049	0.1809	486	0.0469
Air Compressors Composite		0.1120	0.3613	0.7320	0.0007	0.0526	63.6	0.0101
Bore/Drill Rigs	15	0.0120	0.0632	0.0754	0.0002	0.0031	10.3	0.0011
	25	0.0196	0.0660	0.1257	0.0002	0.0065	16.0	0.0018
	50	0.0545	0.2505	0.2820	0.0004	0.0194	31.0	0.0049
	120	0.0722	0.4812	0.6155	0.0009	0.0456	77.1	0.0065
	175	0.0930	0.7543	0.9148	0.0016	0.0481	141	0.0084
	250	0.0957	0.3460	1.1847	0.0021	0.0384	188	0.0086
	500	0.1488	0.5566	1.7054	0.0031	0.0614	311	0.0134
	750	0.2996	1.0997	3.4821	0.0062	0.1231	615	0.0270
	1000	0.5360	1.7074	8.3092	0.0093	0.2078	928	0.0484
Bore/Drill Rigs Composite		0.1052	0.5146	1.1331	0.0017	0.0498	165	0.0095
Cement and Mortar Mixers	15	0.0079	0.0388	0.0505	0.0001	0.0029	6.3	0.0007
	25	0.0346	0.0942	0.1633	0.0002	0.0107	17.6	0.0031
Cement and Mortar Mixers Composite		0.0101	0.0434	0.0599	0.0001	0.0035	7.2	0.0009
Concrete/Industrial Saws	25	0.0200	0.0678	0.1279	0.0002	0.0063	16.5	0.0018
	50	0.1231	0.3210	0.3070	0.0004	0.0301	30.2	0.0111
	120	0.1342	0.4976	0.8601	0.0009	0.0719	74.1	0.0121
	175	0.1927	0.8786	1.6459	0.0018	0.0864	160	0.0174
Concrete/Industrial Saws Composite		0.1270	0.4273	0.6566	0.0007	0.0552	58.5	0.0115
Cranes	50	0.1284	0.3166	0.2547	0.0003	0.0289	23.2	0.0116
	120	0.1117	0.3723	0.6542	0.0006	0.0602	50.1	0.0101
	175	0.1211	0.4880	0.9302	0.0009	0.0538	80.3	0.0109
	250	0.1243	0.3464	1.2372	0.0013	0.0470	112	0.0112
	500	0.1821	0.6625	1.7722	0.0018	0.0685	180	0.0164
	750	0.3082	1.1113	3.0564	0.0030	0.1166	303	0.0278
	9999	1.0894	4.1317	12.1879	0.0098	0.3792	971	0.0983
Cranes Composite		0.1594	0.5431	1.4515	0.0014	0.0642	129	0.0144
Crawler Tractors	50	0.1446	0.3520	0.2780	0.0003	0.0320	24.9	0.0131
	120	0.1551	0.5018	0.9038	0.0008	0.0819	65.8	0.0140
	175	0.1941	0.7597	1.4788	0.0014	0.0856	121	0.0175
	250	0.2051	0.5743	1.9440	0.0019	0.0784	166	0.0185

SCAB Fleet Average Emission Factors (Diesel)

EF-OFFROAD

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**CO2**	**CH4**
	500	0.2913	1.1931	2.7255	0.0025	0.1101	259	0.0263
	750	0.5240	2.1290	4.9881	0.0047	0.1989	465	0.0473
	1000	0.7980	3.3726	8.5998	0.0066	0.2810	658	0.0720
Crawler Tractors Composite		0.1861	0.6409	1.3854	0.0013	0.0854	114	0.0168
Crushing/Proc. Equipment	50	0.2271	0.5592	0.4700	0.0006	0.0520	44.0	0.0205
	120	0.1760	0.5956	1.0382	0.0010	0.0960	83.1	0.0159
	175	0.2367	0.9736	1.8607	0.0019	0.1068	167	0.0214
	250	0.2243	0.6225	2.5465	0.0028	0.0841	245	0.0202
	500	0.3091	1.0542	3.4510	0.0037	0.1187	374	0.0279
	750	0.4956	1.6226	5.6506	0.0059	0.1900	589	0.0447
	9999	1.3820	4.8014	16.0752	0.0131	0.4812	1,308	0.1247
Crushing/Proc. Equipment Composite		0.2152	0.7260	1.4394	0.0015	0.0935	132	0.0194
Dumpers/Tenders	25	0.0108	0.0336	0.0645	0.0001	0.0036	7.6	0.0010
Dumpers/Tenders Composite		0.0108	0.0336	0.0645	0.0001	0.0036	7.6	0.0010
Excavators	25	0.0199	0.0677	0.1261	0.0002	0.0057	16.4	0.0018
	50	0.1131	0.3145	0.2638	0.0003	0.0276	25.0	0.0102
	120	0.1398	0.5318	0.8402	0.0009	0.0781	73.6	0.0126
	175	0.1465	0.6701	1.1143	0.0013	0.0663	112	0.0132
	250	0.1451	0.3934	1.4935	0.0018	0.0519	159	0.0131
	500	0.1984	0.6161	1.9285	0.0023	0.0711	234	0.0179
	750	0.3313	1.0196	3.3023	0.0039	0.1198	387	0.0299
Excavators Composite		0.1483	0.5581	1.1502	0.0013	0.0638	120	0.0134
Forklifts	50	0.0666	0.1824	0.1530	0.0002	0.0163	14.7	0.0060
	120	0.0601	0.2243	0.3497	0.0004	0.0342	31.2	0.0054
	175	0.0738	0.3306	0.5540	0.0006	0.0337	56.1	0.0067
	250	0.0652	0.1707	0.7163	0.0009	0.0227	77.1	0.0059
	500	0.0868	0.2343	0.8909	0.0011	0.0307	111	0.0078
Forklifts Composite		0.0686	0.2319	0.5161	0.0006	0.0281	54.4	0.0062
Generator Sets	15	0.0172	0.0726	0.1154	0.0002	0.0069	10.2	0.0016
	25	0.0300	0.1033	0.1705	0.0002	0.0107	17.6	0.0027
	50	0.1117	0.2904	0.3070	0.0004	0.0284	30.6	0.0101
	120	0.1395	0.5054	0.9075	0.0009	0.0714	77.9	0.0126
	175	0.1672	0.7471	1.4780	0.0016	0.0721	142	0.0151
	250	0.1618	0.5018	2.0720	0.0024	0.0618	213	0.0146
	500	0.2305	0.8858	2.9974	0.0033	0.0917	337	0.0208
	750	0.3838	1.4300	4.9646	0.0055	0.1502	544	0.0346
	9999	1.0080	3.6008	12.1384	0.0105	0.3600	1,049	0.0909
Generator Sets Composite		0.0961	0.3293	0.6440	0.0007	0.0396	61.0	0.0087
Graders	50	0.1400	0.3584	0.2961	0.0004	0.0323	27.5	0.0126
	120	0.1553	0.5459	0.9268	0.0009	0.0849	75.0	0.0140
	175	0.1743	0.7409	1.3532	0.0014	0.0783	124	0.0157
	250	0.1761	0.4934	1.7904	0.0019	0.0662	172	0.0159
	500	0.2149	0.7523	2.1198	0.0023	0.0807	229	0.0194
	750	0.4580	1.5877	4.6098	0.0049	0.1729	486	0.0413
Graders Composite		0.1723	0.6314	1.4338	0.0015	0.0753	133	0.0155
Off-Highway Tractors	120	0.2457	0.7439	1.4200	0.0011	0.1255	93.7	0.0222
	175	0.2326	0.8561	1.7665	0.0015	0.1014	130	0.0210

SCAB Fleet Average Emission Factors (Diesel)

EF-OFFROAD

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**CO2**	**CH4**
	250	0.1881	0.5347	1.7050	0.0015	0.0735	130	0.0170
	750	0.7400	3.5496	6.8440	0.0057	0.2854	568	0.0668
	1000	1.1197	5.5155	11.4633	0.0082	0.4009	814	0.1010
Off-Highway Tractors Composite		0.2368	0.8385	1.9897	0.0017	0.0974	151	0.0214
Off-Highway Trucks	175	0.1732	0.7625	1.2796	0.0014	0.0771	125	0.0156
	250	0.1639	0.4301	1.6150	0.0019	0.0574	167	0.0148
	500	0.2492	0.7542	2.3188	0.0027	0.0872	272	0.0225
	750	0.4069	1.2210	3.8814	0.0044	0.1436	442	0.0367
	1000	0.6440	2.0615	7.3260	0.0063	0.2219	625	0.0581
Off-Highway Trucks Composite		0.2480	0.7429	2.3885	0.0027	0.0875	260	0.0224
Other Construction Equipment	15	0.0118	0.0617	0.0737	0.0002	0.0030	10.1	0.0011
	25	0.0162	0.0545	0.1039	0.0002	0.0053	13.2	0.0015
	50	0.1033	0.2930	0.2787	0.0004	0.0263	28.0	0.0093
	120	0.1320	0.5419	0.8649	0.0009	0.0740	80.9	0.0119
	175	0.1168	0.5901	0.9927	0.0012	0.0543	107	0.0105
	500	0.1705	0.6068	1.9821	0.0025	0.0678	254	0.0154
Other Construction Equipment Composite		0.1056	0.4108	1.0117	0.0013	0.0442	123	0.0095
Other General Industrial Equipmen	15	0.0066	0.0391	0.0466	0.0001	0.0017	6.4	0.0006
	25	0.0186	0.0632	0.1177	0.0002	0.0054	15.3	0.0017
	50	0.1281	0.3073	0.2413	0.0003	0.0285	21.7	0.0116
	120	0.1459	0.4647	0.8218	0.0007	0.0795	62.0	0.0132
	175	0.1516	0.5816	1.1364	0.0011	0.0676	95.9	0.0137
	250	0.1400	0.3676	1.5016	0.0015	0.0509	136	0.0126
	500	0.2500	0.8031	2.6018	0.0026	0.0919	265	0.0226
	750	0.4153	1.3236	4.4083	0.0044	0.1538	437	0.0375
	1000	0.6374	2.2063	7.1530	0.0056	0.2212	560	0.0575
Other General Industrial Equipmen Composite		0.1847	0.5948	1.6649	0.0016	0.0740	152	0.0167
Other Material Handling Equipmen	50	0.1773	0.4246	0.3355	0.0004	0.0395	30.3	0.0160
	120	0.1417	0.4524	0.8014	0.0007	0.0772	60.7	0.0128
	175	0.1914	0.7367	1.4429	0.0014	0.0856	122	0.0173
	250	0.1481	0.3917	1.6024	0.0016	0.0542	145	0.0134
	500	0.1782	0.5784	1.8750	0.0019	0.0660	192	0.0161
	9999	0.8390	2.9174	9.4509	0.0073	0.2912	741	0.0757
Other Material Handling Equipment Composite		0.1773	0.5556	1.6150	0.0015	0.0715	141	0.0160
Pavers	25	0.0278	0.0845	0.1603	0.0002	0.0092	18.7	0.0025
	50	0.1624	0.3860	0.3110	0.0004	0.0356	28.0	0.0147
	120	0.1638	0.5223	0.9693	0.0008	0.0853	69.2	0.0148
	175	0.2049	0.7959	1.6028	0.0014	0.0903	128	0.0185
	250	0.2426	0.7011	2.3337	0.0022	0.0953	194	0.0219
	500	0.2622	1.1661	2.5319	0.0023	0.1023	233	0.0237
Pavers Composite		0.1774	0.5644	0.9868	0.0009	0.0709	77.9	0.0160
Paving Equipment	25	0.0155	0.0521	0.0993	0.0002	0.0051	12.6	0.0014
	50	0.1384	0.3277	0.2654	0.0003	0.0303	23.9	0.0125
	120	0.1282	0.4084	0.7600	0.0006	0.0668	54.5	0.0116
	175	0.1599	0.6208	1.2577	0.0011	0.0704	101	0.0144
	250	0.1506	0.4363	1.4619	0.0014	0.0592	122	0.0136
Paving Equipment Composite		0.1336	0.4478	0.8963	0.0008	0.0629	68.9	0.0121

SCAB Fleet Average Emission Factors (Diesel)

EF-OFFROAD

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**CO2**	**CH4**
Plate Compactors	15	0.0050	0.0263	0.0317	0.0001	0.0015	4.3	0.0005
Plate Compactors Composite		0.0050	0.0263	0.0317	0.0001	0.0015	4.3	0.0005
Pressure Washers	15	0.0083	0.0348	0.0553	0.0001	0.0033	4.9	0.0007
	25	0.0122	0.0419	0.0691	0.0001	0.0043	7.1	0.0011
	50	0.0413	0.1143	0.1388	0.0002	0.0115	14.3	0.0037
	120	0.0388	0.1487	0.2674	0.0003	0.0193	24.1	0.0035
Pressure Washers Composite		0.0199	0.0666	0.0989	0.0001	0.0070	9.4	0.0018
Pumps	15	0.0148	0.0528	0.0862	0.0001	0.0062	7.4	0.0013
	25	0.0439	0.1142	0.1884	0.0002	0.0133	19.5	0.0040
	50	0.1339	0.3428	0.3479	0.0004	0.0333	34.3	0.0121
	120	0.1441	0.5136	0.9216	0.0009	0.0744	77.9	0.0130
	175	0.1709	0.7489	1.4815	0.0016	0.0742	140	0.0154
	250	0.1593	0.4846	1.9941	0.0023	0.0609	201	0.0144
	500	0.2450	0.9411	3.1080	0.0034	0.0973	345	0.0221
	750	0.4167	1.5559	5.2721	0.0057	0.1631	571	0.0376
	9999	1.3269	4.8008	15.8590	0.0136	0.4723	1,355	0.1197
Pumps Composite		0.0936	0.3096	0.5545	0.0006	0.0393	49.6	0.0084
Rollers	15	0.0074	0.0386	0.0461	0.0001	0.0019	6.3	0.0007
	25	0.0164	0.0551	0.1049	0.0002	0.0054	13.3	0.0015
	50	0.1270	0.3169	0.2753	0.0003	0.0292	26.0	0.0115
	120	0.1201	0.4177	0.7383	0.0007	0.0641	59.0	0.0108
	175	0.1478	0.6270	1.2022	0.0012	0.0659	108	0.0133
	250	0.1542	0.4540	1.6232	0.0017	0.0603	153	0.0139
	500	0.1987	0.7785	2.0882	0.0022	0.0783	219	0.0179
Rollers Composite		0.1176	0.4212	0.7749	0.0008	0.0547	67.1	0.0106
Rough Terrain Forklifts	50	0.1590	0.4186	0.3558	0.0004	0.0377	33.9	0.0143
	120	0.1213	0.4447	0.7326	0.0007	0.0676	62.4	0.0109
	175	0.1640	0.7302	1.2875	0.0014	0.0749	125	0.0148
	250	0.1523	0.4270	1.6632	0.0019	0.0567	171	0.0137
	500	0.2097	0.6871	2.1987	0.0025	0.0788	257	0.0189
Rough Terrain Forklifts Composite		0.1272	0.4766	0.7988	0.0008	0.0678	70.3	0.0115
Rubber Tired Dozers	175	0.2398	0.8686	1.7881	0.0015	0.1036	129	0.0216
	250	0.2776	0.7758	2.4482	0.0021	0.1071	183	0.0250
	500	0.3621	1.7411	3.2071	0.0026	0.1370	265	0.0327
	750	0.5457	2.6075	4.9024	0.0040	0.2071	399	0.0492
	1000	0.8464	4.1786	8.4813	0.0060	0.3018	592	0.0764
Rubber Tired Dozers Composite		0.3379	1.4127	2.9891	0.0025	0.1288	239	0.0305
Rubber Tired Loaders	25	0.0206	0.0697	0.1314	0.0002	0.0064	16.9	0.0019
	50	0.1560	0.4005	0.3333	0.0004	0.0361	31.1	0.0141
	120	0.1206	0.4268	0.7227	0.0007	0.0660	58.9	0.0109
	175	0.1476	0.6326	1.1513	0.0012	0.0664	106	0.0133
	250	0.1493	0.4210	1.5357	0.0017	0.0563	149	0.0135
	500	0.2172	0.7648	2.1684	0.0023	0.0819	237	0.0196
	750	0.4484	1.5625	4.5660	0.0049	0.1700	486	0.0405
	1000	0.6154	2.2308	7.1368	0.0060	0.2156	594	0.0555
Rubber Tired Loaders Composite		0.1440	0.5078	1.1537	0.0012	0.0651	109	0.0130
Scrapers	120	0.2236	0.7169	1.3034	0.0011	0.1177	93.9	0.0202

SCAB Fleet Average Emission Factors (Diesel)

EF-OFFROAD

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**CO2**	**CH4**
	175	0.2391	0.9290	1.8284	0.0017	0.1053	148	0.0216
	250	0.2618	0.7368	2.4818	0.0024	0.1006	209	0.0236
	500	0.3650	1.5182	3.4250	0.0032	0.1386	321	0.0329
	750	0.6328	2.6115	6.0373	0.0056	0.2413	555	0.0571
Scrapers Composite		0.3202	1.2424	2.9078	0.0027	0.1256	262	0.0289
Signal Boards	15	0.0072	0.0377	0.0450	0.0001	0.0017	6.2	0.0006
	50	0.1492	0.3827	0.3689	0.0005	0.0364	36.2	0.0135
	120	0.1495	0.5380	0.9446	0.0009	0.0792	80.2	0.0135
	175	0.1907	0.8437	1.6203	0.0017	0.0846	155	0.0172
	250	0.2049	0.6138	2.5094	0.0029	0.0789	255	0.0185
Signal Boards Composite		0.0224	0.0953	0.1615	0.0002	0.0091	16.7	0.0020
Skid Steer Loaders	25	0.0249	0.0700	0.1252	0.0002	0.0079	13.8	0.0022
	50	0.0785	0.2507	0.2463	0.0003	0.0217	25.5	0.0071
	120	0.0607	0.2822	0.4131	0.0005	0.0355	42.8	0.0055
Skid Steer Loaders Composite		0.0692	0.2489	0.2919	0.0004	0.0252	30.3	0.0062
Surfacing Equipment	50	0.0589	0.1520	0.1451	0.0002	0.0142	14.1	0.0053
	120	0.1192	0.4334	0.7683	0.0007	0.0624	63.8	0.0108
	175	0.1071	0.4787	0.9169	0.0010	0.0472	85.8	0.0097
	250	0.1254	0.3883	1.3783	0.0015	0.0494	135	0.0113
	500	0.1854	0.7785	2.0517	0.0022	0.0741	221	0.0167
	750	0.2960	1.2171	3.2929	0.0035	0.1173	347	0.0267
Surfacing Equipment Composite		0.1550	0.6164	1.5685	0.0017	0.0606	166	0.0140
Sweepers/Scrubbers	15	0.0124	0.0729	0.0870	0.0002	0.0033	11.9	0.0011
	25	0.0239	0.0808	0.1524	0.0002	0.0075	19.6	0.0022
	50	0.1508	0.3893	0.3297	0.0004	0.0355	31.6	0.0136
	120	0.1490	0.5329	0.8645	0.0009	0.0843	75.0	0.0134
	175	0.1856	0.8049	1.4276	0.0016	0.0854	139	0.0167
	250	0.1344	0.3643	1.5598	0.0018	0.0489	162	0.0121
Sweepers/Scrubbers Composite		0.1548	0.5380	0.8473	0.0009	0.0686	78.5	0.0140
Tractors/Loaders/Backhoes	25	0.0214	0.0681	0.1317	0.0002	0.0072	15.9	0.0019
	50	0.1257	0.3548	0.3114	0.0004	0.0312	30.3	0.0113
	120	0.0910	0.3623	0.5664	0.0006	0.0515	51.7	0.0082
	175	0.1216	0.5881	0.9646	0.0011	0.0562	101	0.0110
	250	0.1418	0.4037	1.5493	0.0019	0.0523	172	0.0128
	500	0.2630	0.8495	2.7242	0.0039	0.0980	345	0.0237
	750	0.3986	1.2725	4.2276	0.0058	0.1496	517	0.0360
Tractors/Loaders/Backhoes Composite		0.1021	0.3930	0.6747	0.0008	0.0521	66.8	0.0092
Trenchers	15	0.0099	0.0517	0.0617	0.0001	0.0023	8.5	0.0009
	25	0.0400	0.1355	0.2555	0.0004	0.0125	32.9	0.0036
	50	0.1837	0.4365	0.3620	0.0004	0.0405	32.9	0.0166
	120	0.1509	0.4840	0.9082	0.0008	0.0776	64.9	0.0136
	175	0.2254	0.8843	1.7973	0.0016	0.0990	144	0.0203
	250	0.2770	0.8161	2.6802	0.0025	0.1103	223	0.0250
	500	0.3468	1.6352	3.4013	0.0031	0.1373	311	0.0313
	750	0.6586	3.0677	6.5218	0.0059	0.2602	587	0.0594
Trenchers Composite		0.1675	0.4907	0.7598	0.0007	0.0637	58.7	0.0151
Welders	15	0.0124	0.0441	0.0720	0.0001	0.0052	6.2	0.0011

SCAB Fleet Average Emission Factors (Diesel)

EF-OFFROAD

Air Basin	SC

		(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
Equipment	**MaxHP**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**CO2**	**CH4**
	25	0.0254	0.0661	0.1091	0.0001	0.0077	11.3	0.0023
	50	0.1231	0.3025	0.2724	0.0003	0.0287	26.0	0.0111
	120	0.0807	0.2738	0.4899	0.0005	0.0428	39.5	0.0073
	175	0.1333	0.5515	1.0896	0.0011	0.0590	98.2	0.0120
	250	0.1052	0.3022	1.2367	0.0013	0.0400	119	0.0095
	500	0.1327	0.4823	1.5648	0.0016	0.0520	168	0.0120
Welders Composite		0.0805	0.2246	0.2920	0.0003	0.0270	25.6	0.0073

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Heavy-Heavy-Duty Diesel Trucks (33,001 to 60,000 pounds)

The following emission factors were compiled by running the California Air Resources Board's EMFAC2007 (version 2.3) Burden Model and extracting the **Heavy-Heavy-Duty Diesel Truck (HHDT)** Emission Factors.

These emission factors can be used to calculate on-road mobile source emissions for the vehicle/emission categories listed in the tables below, by use of the following equation:

Emissions (pounds per day) = N x TL x EF

where N = number of trips, TL = trip length (miles/day), and EF = emission factor (pounds per mile)

The **HHDT-DSL** vehicle/emission category accounts for all emissions from heavy-heavy-duty diesel trucks, including start, running and idling exhaust. In addition, ROG emission factors account for diurnal, hot soak, running and resting emissions, and the PM10 & PM2.5 emission factors account for tire and brake wear.

The **HHDT-DSL, Exh** vehicle/emission category includes only the exhaust portion of PM10 & PM2.5 emissions from heavy-heavy-duty diesel trucks.

Scenario Year: **2007**
All model years in the range 1965 to 2007

HHDT-DSL (pounds/mile)	
CO	0.01446237
NOx	0.04718166
ROG	0.00372949
SOx	0.00003962
PM10	0.00230900
PM2.5	0.00204018
CO2	4.22184493

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00216752
PM2.5	0.00199491

Scenario Year: **2008**
All model years in the range 1965 to 2008

HHDT-DSL (pounds/mile)	
CO	0.01361368
NOx	0.04458017
ROG	0.00351579
SOx	0.00004136
PM10	0.00215635
PM2.5	0.00189990
CO2	4.21067145
CH4	0.00016269

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00201296
PM2.5	0.00185303

Scenario Year: **2009**
All model years in the range 1965 to 2009

HHDT-DSL (pounds/mile)	
CO	0.01282236
NOx	0.04184591
ROG	0.00329320
SOx	0.00004013
PM10	0.00199572
PM2.5	0.00175227
CO2	4.21080792
CH4	0.00015249

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00185393
PM2.5	0.00170680

Scenario Year: **2010**
All model years in the range 1966 to 2010

HHDT-DSL (pounds/mile)	
CO	0.01195456
NOx	0.03822102
ROG	0.00304157
SOx	0.00004131
PM10	0.00183062
PM2.5	0.00160083
CO2	4.21120578
CH4	0.00014201

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00168861
PM2.5	0.00155435

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Heavy-Heavy-Duty Diesel Trucks (33,001 to 60,000 pounds)

Scenario Year: **2011**
All model years in the range 1967 to 2011

HHDT-DSL (pounds/mile)	
CO	0.01112463
NOx	0.03455809
ROG	0.00279543
SOx	0.00003972
PM10	0.00166087
PM2.5	0.00144489
CO2	4.22045680
CH4	0.00012910

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00151936
PM2.5	0.00139772

Scenario Year: **2012**
All model years in the range 1968 to 2012

HHDT-DSL (pounds/mile)	
CO	0.01021519
NOx	0.03092379
ROG	0.00252764
SOx	0.00004042
PM10	0.00149566
PM2.5	0.00129354
CO2	4.21590774
CH4	0.00011651

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00135537
PM2.5	0.00124837

Scenario Year: **2013**
All model years in the range 1969 to 2013

HHDT-DSL (pounds/mile)	
CO	0.00931790
NOx	0.02742935
ROG	0.00226308
SOx	0.00004086
PM10	0.00133697
PM2.5	0.00114629
CO2	4.21518556
CH4	0.00010441

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00119623
PM2.5	0.00109863

Scenario Year: **2014**
All model years in the range 1970 to 2014

HHDT-DSL (pounds/mile)	
CO	0.00846435
NOx	0.02418049
ROG	0.00201594
SOx	0.00004092
PM10	0.00118458
PM2.5	0.00100582
CO2	4.21279345
CH4	0.00009261

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00104243
PM2.5	0.00096059

Scenario Year: **2015**
All model years in the range 1971 to 2015

HHDT-DSL (pounds/mile)	
CO	0.00766891
NOx	0.02122678
ROG	0.00178608
SOx	0.00004082
PM10	0.00104715
PM2.5	0.00087977
CO2	4.20902225
CH4	0.00008369

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00090631
PM2.5	0.00083282

Scenario Year: **2016**
All model years in the range 1972 to 2016

HHDT-DSL (pounds/mile)	
CO	0.00704604
NOx	0.01887374
ROG	0.00161035
SOx	0.00003952
PM10	0.00094448
PM2.5	0.00078443
CO2	4.21063031
CH4	0.00007508

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00080419
PM2.5	0.00073898

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)
Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:
Heavy-Heavy-Duty Diesel Trucks (33,001 to 60,000 pounds)

Scenario Year: **2017**
All model years in the range 1973 to 2017

HHDT-DSL (pounds/mile)	
CO	0.00650533
NOx	0.01690387
ROG	0.00145203
SOx	0.00004033
PM10	0.00084894
PM2.5	0.00069721
CO2	4.20820129
CH4	0.00006722

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00070873
PM2.5	0.00065111

Scenario Year: **2018**
All model years in the range 1974 to 2018

HHDT-DSL (pounds/mile)	
CO	0.00604721
NOx	0.01526414
ROG	0.00131697
SOx	0.00003934
PM10	0.00076808
PM2.5	0.00062383
CO2	4.20756838
CH4	0.00006182

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00062758
PM2.5	0.00057700

Scenario Year: **2019**
All model years in the range 1975 to 2019

HHDT-DSL (pounds/mile)	
CO	0.00565433
NOx	0.01389113
ROG	0.00120235
SOx	0.00004032
PM10	0.00070198
PM2.5	0.00056085
CO2	4.20637830
CH4	0.00005499

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00056085
PM2.5	0.00051320

Scenario Year: **2020**
All model years in the range 1976 to 2020

HHDT-DSL (pounds/mile)	
CO	0.00532242
NOx	0.01274755
ROG	0.00110621
SOx	0.00003957
PM10	0.00064574
PM2.5	0.00050904
CO2	4.20541416
CH4	0.00005216

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00050364
PM2.5	0.00046227

Scenario Year: **2021**
All model years in the range 1977 to 2021

HHDT-DSL (pounds/mile)	
CO	0.00503726
NOx	0.01179977
ROG	0.00103095
SOx	0.00004033
PM10	0.00059437
PM2.5	0.00046287
CO2	4.21495573
CH4	0.00004734

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00045411
PM2.5	0.00041729

Scenario Year: **2022**
All model years in the range 1978 to 2022

HHDT-DSL (pounds/mile)	
CO	0.00478830
NOx	0.01098794
ROG	0.00096142
SOx	0.00004106
PM10	0.00055427
PM2.5	0.00042597
CO2	4.21520828
CH4	0.00004448

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00041399
PM2.5	0.00037807

Highest (Most Conservative) EMFAC2007 (version 2.3)
Emission Factors for On-Road Heavy-Heavy-Duty Diesel Trucks

Projects in the SCAQMD (Scenario Years 2007 - 2026)

Derived from Peak Emissions Inventory (**Winter**, **Annual**, **Summer**)

Vehicle Class:

Heavy-Heavy-Duty Diesel Trucks (33,001 to 60,000 pounds)

Scenario Year: **2023**

All model years in the range 1979 to 2023

HHDT-DSL (pounds/mile)	
CO	0.00457902
NOx	0.01031407
ROG	0.00090210
SOx	0.00004009
PM10	0.00052122
PM2.5	0.00039592
CO2	4.21483461
CH4	0.00004176

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00037922
PM2.5	0.00034915

Scenario Year: **2024**

All model years in the range 1980 to 2024

HHDT-DSL (pounds/mile)	
CO	0.00444444
NOx	0.00974372
ROG	0.00084009
SOx	0.00003930
PM10	0.00050766
PM2.5	0.00038320
CO2	4.19552935
CH4	0.00003930

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00036682
PM2.5	0.00033735

Scenario Year: **2025**

All model years in the range 1981 to 2025

HHDT-DSL (pounds/mile)	
CO	0.00431086
NOx	0.00932573
ROG	0.00080206
SOx	0.00004018
PM10	0.00048541
PM2.5	0.00036326
CO2	4.19512979
CH4	0.00003697

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00034397
PM2.5	0.00031664

Scenario Year: **2026**

All model years in the range 1982 to 2026

HHDT-DSL (pounds/mile)	
CO	0.00420297
NOx	0.00898990
ROG	0.00077178
SOx	0.00003946
PM10	0.00046717
PM2.5	0.00034564
CO2	4.19349747
CH4	0.00003630

HHDT-DSL, Exh (pounds/mile)	
PM10	0.00032670
PM2.5	0.00029830

Appendix C
Emission Calculations for Operation and Maintenance Activities
West Chocolate Mountains Solar PV Development

Table No.	Table Description
Table C1	Summary of Operational Emissions per 50-MW Solar PV plant
Table C2	Criteria Pollutants Emissions from Operations and Maintenance
Table C3	Fugitive Dust Emission Factors - Roads
Table C4	Fugitive Dust Emissions from Road
Table C5	GHG Emissions from Operation and Maintenance Activities

Table C1

Summary of Operational Emissions per 50-MW Solar PV plant

West Chocolate Mountains Solar PV Development

Estimation per year

Emission Type	Source	Emissions (tons/year)						GHG Emissions (metric tons/year)
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2e
Exhaust Emissions	Heavy Duty Diesel Truck	0.000	0.001	0.001	0.005	0.000	0.000	0.5
	ATVs	17	371	3.312	0.387	0.533	0.533	0.9
Fugitive Dust Emissions	Roads	-	-	-	-	0.136	0.014	-
Subtotal		**16.9**	**371.3**	**3.3**	**0.4**	**0.7**	**0.5**	**1.3**

Estimation per day

Emission Type	Source	Emissions (tons/day)					
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Exhaust Emissions	Heavy Duty Diesel Truck	0.0001	0.0004	0.0011	0.0000	0.0001	0.0000
	ATVs	0.0004	0.0091	0.0001	0.0000	0.0000	0.0000
Fugitive Dust Emissions	Roads	-	-	-	-	0.0104	0.0011
Subtotal per day		**0.001**	**0.009**	**0.001**	**0.000**	**0.011**	**0.001**

Estimation for the first year (125 days of operations)

Emission Type	Source	Emissions (tons/year)					
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Exhaust Emissions	Heavy Duty Diesel Truck	0.01	0.04	0.14	0.00	0.01	0.01
	ATVs	0.05	1.14	0.01	0.00	0.00	0.00
Fugitive Dust Emissions	Roads	-	-	-	-	1.31	0.13
Subtotal first yeat of operations		**0.06**	**1.19**	**0.15**	**0.00**	**1.31**	**0.14**

Table C2
Criteria Pollutants Emissions from Operations and Maintenance
West Chocolate Mountains Solar PV Development

Solar Panel Cleaning and Array Inspection (Quarterly)

Project Component	Vehicle Type	No. of Units	Weekly (days/wk)	Annual (wk/yr)	Vehicle Mileage		
					Daily per Vehicle (VMT/day)	Total Daily (VMT/day)	Total Annual (VMT/yr)
Solar PV Field	Water Truck	1	1	4	60	60	240
Solar PV Field	All-Terrain Vehicle	2	1	4	60	120	480
					-	-	-

Notes:

Vehicles Mile Traveled estimated as 60 miles per roundtrip, considering an average distance from the closest cities (Barstow, Victorville and Hesperia) to the project site.

Number of Vehicles estimated based on similar Solar PV projects

Inverter and Switchyard maintenance

Project Component	Vehicle Type	No. of Units	Weekly (days/wk)	Annual (wk/yr)	Vehicle Mileage		
					Vehicle (VMT/day)	Total Daily (VMT/day)	Total Annual (VMT/yr)
Mechanical Inspection	All-Terrain Vehicle	1	1	52	60	60	3120
Electrical Inspection	All-Terrain Vehicle	1	1	1	60	60	60
					-	-	-

Notes:

The inverter mechanical maintenance is conducted monthly and consists of: inspection of intake air ducts, cooling fans, and refrigeration units.

Electrical inspections are conducted yearly and consists of: inspection of seals, electrical connections (torque setting), and transformer and/or inductor enclosure.

Number of Vehicles estimated based on similar Solar PV projects

Emission Calculations

Pollutant	Water Truck Emission Factor[a] (lb/VMT)	ATV Emission Factor[b] (lb/VMT)	Daily Emissions (lbs/day)			Annual Emissions (tons/yr)		
			Truck Operations	ATV Operations	TOTAL	Truck Operations	ATV Operations	TOTAL
ROG	0.003042	0.0046270	0.2	0.8	1.0	0.0004	16.9	16.9
CO	0.011955	0.10146	0.7	18.3	19.0	0.0014	371.3	371
NOx	0.038221	0.0009048	2.3	0.2	2.5	0.0046	3.3	3.3
SOx	0.000041	0.00010582	0.0	0.0	0.0	0.0000	0.4	0.4
PM10	0.001831	0.00014550	0.1	0.0	0.1	0.0002	0.5	0.5
PM2.5	0.001601	0.00014550	0.1	0.0	0.1	0.0002	0.5	0.5

Notes:

a. South Coast Air Quality Management District (SCAQMD). 2008. Spreadsheet onroadEF07_26.xls.

b. Emission factors for ATVs from EPA's NONROAD model.

Table C3
Fugitive Dust Emission Factors - Roads

Unpaved Roads - Emission Factor Derivation

$E = k(s/12)^a(W/3)^b$ AP-42 Section 13.2.2 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k, a, b = empirical constants for industrial roads
s = surface material silt content (%)
W = average vehicle weight (tons)

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	**tons**	2	2	Assumption
Constant, k	lb/VMT	1.5	0.15	Table 13.2.2-2 (worst case)
Constant, a		0.9	0.9	Table 13.2.2-2 (worst case)
Constant, b		0.45	0.45	Table 13.2.2-2 (worst case)
Silt content, s	%	8.5	8.5	Table 13.2..2-1 (construction sites)
Uncontrolled Emission factor, E	**lb/VMT**	**0.92**	**0.092**	**Calculation**
Control Efficiency for Watering	%	0.65	0.65	Assumption
Controlled Emission factor, E	**lb/VMT**	**0.32**	**0.032**	**Calculation**

Paved Roads - Emission Factor Derivation Table

$E = (k(sL/2)^{0.65}(W/3)^{1.5}-C)$ AP-42 Section 13.2.1 (11/06 version)

where:

E = particulate emission factor (lb/VMT)
k = particle size multiplier
sL = road surface silt loading (g/m^2)
W = average vehicle weight (tons)
C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

Parameter	Units	PM_{10}	$PM_{2.5}$	Reference
Mean Vehicle Weight	tons	3	3	Assumption
k factor	lb/VMT	0.016	0.0024	Table 13.2-1.1
Silt Loading, sL	g/m^2	0.6	0.6	Table 13.2.1-3
Emission factor, C	lb/VMT	0.00047	0.00036	Table 13.2.1-2
Uncontrolled Emission factor, E	**lb/VMT**	**0.00685**	**0.000737**	**Calculation**

Table C4
Fugitive Dust Emissions from Road

Annual Emissions

Fuel Type	Total VMT/year		Emissions (tons/year)					
			Unpaved Roads		Paved Roads		All Roads	
	Paved Roads	Unpaved Roads	PM10	PM2.5	PM10	PM2.5	PM10	PM2.5
Heavy Duty Diesel Truck	192	48	0.008	0.001	0.001	0.000	0.01	0.001
ATVs	2,928	732	0.12	0.012	0.010	0.001	0.13	0.01
Total	**-**	**-**	**0.0077**	**0.0008**	**0.0007**	**0.0001**	**0.136**	**0.014**

Daily Emissions

Fuel Type	Total VMT/day		Emissions (tons/day)					
			Unpaved Roads		Paved Roads		All Roads	
	Paved Roads	Unpaved Roads	PM10	PM2.5	PM10	PM2.5	PM10	PM2.5
Heavy Duty Diesel Truck	48	12	0.002	0.0002	0.0002	0.000	0.002	0.000
ATVs	192	48	0.008	0.001	0.001	0.0001	0.008	0.001
Total	**-**	**-**	**0.0019**	**0.0002**	**0.0002**	**0.0000**	**0.010**	**0.001**

Table C5
GHG Emissions from Operation and Maintenance Activities
Lucerne Valley Solar Project

GHG Emissions Estimation for Operation and Maintenance Activities

Emission Type	GHG	Emission Factors [a,b,c]	Emission Factor Units	Annual Emissions (lbs/yr)	Annual Emissions (tonnes/yr)	Global Warming Potential	Annual Emissions [as CO2-eq] (tonnes/yr)
Water Truck Emissions	CO2	4.211	lb/VMT	1,011	0.5	1	0.5
(Maintenance Activities)	CH4	0.000142	lb/VMT	0.034	0.00002	23	0.0
ATVs Emissions	CO2	0.516610	lb/VMT	1,891	0.9	1	0.9
(Maintenance Activities)	CH4	0.000000	lb/VMT	0	0.0	23	0.0
Electrical Consumption	CO2	0.724120	lb/kWh			1	
	CH4	0.000030	lb/kWh			23	
SF6 Leakage	SF6	0.50%	% per year per capacity			23,900	
Refrigerant Leakage	TBD	0.50%	% per year per capacity			TBD	
TOTAL	**-**	**-**	**-**	**-**	**-**	**-**	**1.3**

Notes:

a. South Coast Air Quality Management District (SCAQMD). 2008. Spreadsheet onroadEF07_26.xls: "Highest (Most Conservative) EMFAC2007 (version 2.3) Emission Factors for On-Road Passenger Vehicles & Delivery Trucks". Downloaded from SCAQMD Website.

c. Emission factors for ATVs from EPA's NONROAD model.

b. U.S. Environmental Protection Agency (EPA). 2009. eGrid2007 Version 1.1 Year 2005 GHG Annual Output Emission Rates (California). Downloaded from www.epa.gov/egrid

Table C6
On-Road Vehicle Exhaust Emission Factors

Equipment Type	Emission Factor[a,b] (pounds/VMT)							
	ROG	CO	NOx	SOx	PM10	PM2.5	CO2	CH4
Heavy Duty Diesel Trucks	0.003042	0.011955	0.038221	0.000041	0.001831	0.001601	4.211206	0.000142
Light Duty Trucks	0.002590	0.01844	0.02062	0.0000270	0.0007512	0.0006243	2.732	0.0001258
Gasoline Passenger Vehicles	0.0009140	0.00826	0.0009181	0.00001077	0.00008698	0.00005478	1.096	0.00008146
ATVs	0.0046270	0.10146	0.0009048	0.00010582	0.00014550	0.00014550	0.517	0.00000000

Notes:

a. Emission factors for trucks and vehicles from SCAQMD file "onroadEF07_26.xls".

b. Emission factors for ATVs from EPA's NONROAD model.

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